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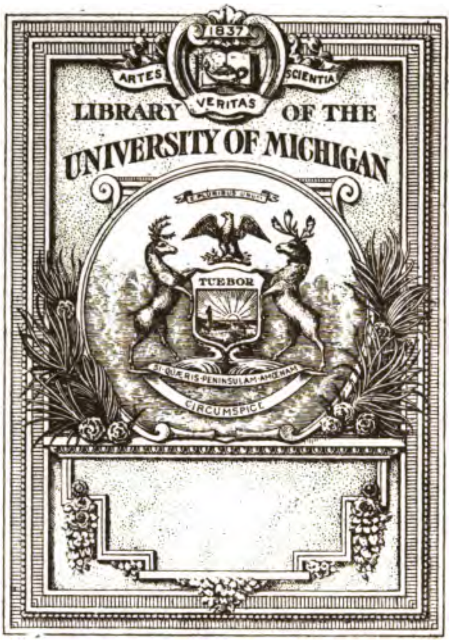

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BIENNIAL REPORT

OF THE

NORTH CAROLINA BOARD OF HEALTH,

TO THE

GENERAL ASSEMBLY OF NORTH CAROLINA,

SESSION 1887.

RALEIGH:
P. M. HALE, STATE PRINTER AND BINDER.
1887.

MEMBERS OF THE BOARD.

J. W. JONES, Tarboro, *President*	Term	expires	1889.
THOMAS F. WOOD, M. D., Wilmington, *Secretary*	"	"	1891.
R. L. PAYNE, M. D., Lexington	"	"	1887.
JOHN McDONALD, M. D., Washington	"	"	1889.
RICHARD H. LEWIS, M. D., Raleigh *	"	"	1887.
W. D. HILLIARD, M. D., Asheville	"	"	1891.
ARTHUR WINSLOW, C. E., Raleigh	"	"	1887.
Prof. W. G. SIMMONS, Wake Forest	"	"	1887.
SAM'L H. LYLE, M. D., Franklin	"	"	1887.

* Elected to fill the unexpired term of Dr. Whitehead.

COMMITTEES.

Epidemics—Drs. Wood and Jones.

Water Supply and Drainage—Dr. Wood and Mr. Winslow.

Hygienics of Public Schools—Drs. Hilliard and Lyle.

Illuminating Oils—Prof. Simmons.

Climatology—Dr. Jones.

Adulteration of Foods and Medicines—Drs. Payne and McDonald.

Vital Statistics—Drs. Lewis and Wood.

Sanitary Inspection—Drs. Jones and Payne.

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OF THE

NORTH CAROLINA BOARD OF HEALTH,

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SESSION 1887.

RALEIGH:
P. M. HALE, STATE PRINTER AND BINDER.
1887.

STATE OF NORTH CAROLINA,
STATE BOARD OF HEALTH,
WILMINGTON, December 31, 1886.

His Excellency, ALFRED M. SCALES, *Governor:*

SIR:—In accordance with Section 2 of the "Act Relating to the Board of Health," I have the honor to present this, the first biennial report of the North Carolina Board of Health, under the amended law, ratified in the General Assembly on the 9th day of March, A. D. 1885.

Very respectfully,
Your obedient servant,
THOMAS F. WOOD, M. D.,
Secretary and Treasurer.

SECRETARY'S REPORT.

AN ACT

RELATING TO THE BOARD OF HEALTH.

The General Assembly of North Carolina do enact:

SECTION 1. That the Medical Society of North Carolina shall choose from its members, by ballot, six members, and the Governor shall appoint three other persons (one of whom shall be a civil engineer), and these shall constitute the "North Carolina Board of Health."

SEC. 2. That the "North Carolina Board of Health" shall take cognizance of the health interests of the citizens of the State; shall make sanitary investigations and inquiries in respect to the people, employing experts when necessary; shall investigate the causes of diseases dangerous to the public health, especially epidemics; the sources of mortality; the effects of locations, employments and conditions upon the public health. They shall gather such information upon all these matters, for distribution among the people, with the especial purpose of informing them about preventable diseases. They shall be the medical advisers of the State, and are herein specially provided for, and shall advise the government in regard to the location, sanitary construction and management of all public institutions, upon application of the proper authorities, and shall direct the attention of the State to such sanitary matters as in their judgment affect the industry, prosperity, health and lives of the citizens of the State. The secretary of the board shall make biennially to the General Assembly, through the Governor, a report of their work.

SEC. 3. The members of the Board of Health as elected by the State Medical Society shall be chosen to serve, two for six years, two for four years, and two for two years. Those appointed by the Governor shall serve for two years. In case of death or resignation the Board shall elect new members to fill the unexpired term.

SEC. 4. The State Board shall have a president and secretary, who shall be treasurer, to be elected from members comprising the board. The president shall serve two years, and the secretary and treasurer six years. The secretary and treasurer shall receive such yearly compensation for his services as shall be fixed upon by the Board, but the other members of the Board shall receive no pay except that while on actual duty at meetings of the Board, or on duty during the time special investigations are being pursued, each member shall receive four dollars a day and necessary traveling expenses. These sums shall be paid by the treasurer on duly authenticated requisitions signed and approved by the president of the Board.

SEC. 5. There shall be an auxiliary board of health in each county in the State. These boards shall be composed of the physicians who shall have complied with the laws of the State in regard to the practice of medicine and surgery, or have a diploma from a regular medical college, the mayor of the county town, chairman of the board of county commissioners, and the city surveyor, where there is such an officer, otherwise the county surveyor. From this number one physician shall be chosen by ballot to serve two years, with the title of superintendent of health. His duties shall be to gather vital statistics upon a plan designated by the State Board of Health. He shall make the medico-legal *post mortem* examinations for coroner's inquests and attend to prisoners in jail, poor-house, house of correction, and make examination of lunatics for commitment. He shall be the sanitary inspector of the jail and poor-house of his county, making monthly reports to the board of county commissioners. His reports shall be made regularly as advised by the State Board, through their secretary, and he shall receive and carry out as far as practicable such work as may be directed by the State Board of Health: *Provided*, that if it is impracticable to get a county superintendent for any cause, then any one whose duty it is to provide such service may employ any member of the county board of health to do anything required by this section.

SEC. 6. The salary of the county superintendent of health shall be paid out of the county treasury upon requisition and the proper vouchers as follows: The salary of superintendent of health, or any other member of the board who is required to do the services assigned him, shall be such sum as the county commissioners shall deem just and proper for his services as physician to the public, charitable and penal institutions of the country.

SEC. 7. The biennial meeting of the election of officers shall, after the meeting of organization, be for the county boards on the first Monday in January, and of the State Board of Health on the second day of the annual meeting of the Medical Society of North Carolina.

SEC. 8. Monthly returns of vital statistics upon a plan to be made by the county superintendent of health, and a failure to report by the tenth of the month of the preceding month shall subject the delinquent to a fine of one dollar for each day of delinquency, and this amount shall be deducted from the salary of the superintendent by the board of county commissioners, on authenticated statement of such delinquency by the secretary of the State Board of Health.

SEC. 9. Inland quarantine shall be under the control of the county superintendent of health, who, acting by the advice of the local board, shall see that diseases dangerous to the public health, viz.: small-pox, scarlet fever, yellow fever and cholera, shall be properly quarantined or isolated at the expense of the city, or town, or county in which they occur. Any person violating the rules promulgated on this subject shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined or imprisoned at the discretion of the court. In case the offender be stricken with disease for which he is quarantinable, he will be subject to the penalty on recovery, unless in the opinion of the superintendent it should be omitted. Quarantine of ports shall not be interfered with, but the officers of the local and State boards shall render all the aid in their power to quarantine officers in the discharge of their duties, upon the request of the latter.

SEC. 10. Whenever and wherever a nuisance upon premises shall exist, which, in the opinion of the county superintendent of health, is dangerous to the public health, it shall be his duty to notify in writing the parties occupying the premises (or the owner, if the premises are not occupied), of its existence, its character and the means of abating it. Upon this notification the parties shall proceed to abate the nuisance, but failing to do this shall be adjudged guilty of a misdemeanor, and shall pay a fine of one dollar a day, dating from twenty-four hours after the notification has been served, the amounts so collected to be turned over to the county treasurer: *Provided, however*, that if the party notified shall make oath or affirmation before a magistrate of his or her inability to carry out the directions of the superintendent, it shall be done at the expense of the town, city or county in which the offender lives. In the latter case the limit of the expense chargeable to the city, town or county shall not be more than one hundred dollars in any case: *Provided, further*, that nothing in this section shall be construed to give the superintendent the power to destroy or injure property without a due process of law, as now exists for the abatement of nuisances.

SEC. 11. Vaccination: On the appearance of a case of smallpox in any neighborhood, all due diligence shall be used by the superintendent of health that warning shall be given, and all persons not able to pay, shall be vaccinated free of charge by him, and the county superintendent shall vaccinate every person admitted into a public institution (jail, poor-house, public school) as soon as practicable, unless he is satisfied, upon examination, that the person is already successfully vaccinated. The money for vaccine to be furnished by the county commissioners.

SEC. 12. Bulletins of the outbreak of disease dangerous to the public health shall be issued by the State Board, whenever necessary, and such advice freely disseminated to prevent and check the invasion of disease into any part of the State. It shall also be the duty of the Board to inquire into any outbreak of disease by personal visits or by any method the Board shall direct. The compensation of members on such duty shall be four dollars a day and all necessary traveling expenses.

SEC. 13. Special meetings of the State Board of Health may be called by the president through the secretary. The regular annual meetings shall be held at the same time and place of the State Medical Society, at which time the secretary shall submit his annual report.

SEC. 14. Analyses for purposes connected with the hygienic duties of the superintendent of health shall be made by the chemist of the Agricultural Station upon requisition signed, approved by the secretary of the State Board of Health. Such analyses will include soil, drinking water, articles of food, &c., to be packed for transmission by direction of the Chemist of the Agricultural Station.

SEC. 15. For carrying out the provisions of this act, two thousand dollars, or so much thereof as may be necessary, are hereby annually appropriated, to be paid on requisition signed by the treasurer and president of the State Board of Health, and the printing and stationery necessary for the Board to be furnished upon requisition upon the public printer, which shall not exceed two hundred and fifty dollars annually. A yearly statement shall be made to the State Treasurer of all moneys received and expended in pursuance of this act.

SEC. 16. A contingent fund of two thousand dollars is hereby appropriated, subject to the Governor's warrant, countersigned and recorded by the Auditor of the State, to be expended in pursuance of the provisions of this act when rendered necessary by a visitation of cholera or any other pestilential disease.

SEC. 17. All previous acts conflicting with this act are hereby repealed upon the passage of this act.

SEC. 18. This act is in force from and after its ratification.

In the General Assembly read three times, and ratified this the 9th day of March, A. D. 1885.

The Board began its work under the amended laws in March, 1885, being composed of Drs. J. W. Jones, Tarborough, President; R. L. Payne, Lexington; S. S. Satchwell, Rocky Point; John McDonald, Washington; Richard H. Lewis, Raleigh; Samuel H. Lyle, Franklin; Arthur Winslow, C. E., Raleigh; Prof. W. G. Simmons, Wake Forest; and Dr. Thomas F. Wood, Wilmington, Secretary. Of these, Dr. S. H. Lyle, Prof. W. G. Simmons and Mr. Arthur Winslow were appointed by the Governor, and Dr. Richard H. Lewis was elected to the vacancy caused by the death of Dr. Whitehead.

The first duty was that of reorganization of county boards of health and of stimulating new organizations in those counties where none existed. The object of county boards of health is not only to get reports of the condition of health and of prevailing diseases dangerous to public health in the various counties, but to get frequent inspections of the public buildings of the counties, in order that the public might know in what way these institutions are conducted; and in so doing they utilize the services of the public officer—the county superintendent of health—who being physician to the county—an indispensable office—had added to his work that of a public hygienist.

At the time of the meeting of the reorganization of the State Board, held in Raleigh on the 20th–21st of March, 1885, there were no counties sending in regular reports save, perhaps, New Hanover. At the time of this report there are fifty. By this organized machinery in the ninety-six counties of the State, the good to result from practical inspections of the public health would be greatly enhanced. The growth of such work is necessarily slow, but it has been much slower than we would have supposed, seeing that the law specifies how county boards *shall be* established and sets forth this very plainly as the way of supplying medical service to a county.

Sec. 5 of the act says: "There shall be an auxiliary board of health in each county in the State. These boards shall be composed of the physicians who shall have complied with the laws of the State in regard to the practice of medicine and surgery, or have a diploma from a regular medical college, the mayor of the county town, chairman of the board of county commissioners, and the city surveyor, where there is such an officer, otherwise the county surveyor. From this number one physician shall be chosen by ballot to serve two years, with the title of superintendent of health. His duties shall be to gather vital statistics upon a plan designated by the State Board of Health. He shall make the medico-legal *post mortem* examinations for coroner's inquests, and attend to prisoners in jail, poor-house, house of correction, and make examination of lunatics for commitment. He shall be the sanitary inspector of the jail and poor-house of his county, making monthly reports to the board of county commissioners. His reports shall be made regularly as advised by the State Board, through their secretary, and he shall receive and carry out, as far as practicable, such work as may be directed by the State Board of Health: *Provided*," etc.

By comparison of the reports which have been received from various parts of the State, it will be seen how varied has been their nature, but it will also be observed that they have improved in quality as well as increased in numbers; but much is still to be desired in both directions.

For some time the old form of report was used embracing weather reports and school statistics, but as the latter of these was regarded as unnecessary each month, it was thought better to adopt a more simple form, consisting of reports on the existence of contagious diseases, on epidemics among men and animals, on the number of inmates in poor-house, jail and house of correction, with the number of cubic feet of space allotted each, the quality and quantity of food and water served each, the number which have been vaccinated, and the number which can read and write, and remarks on the sanitary condition of county and public buildings.

This form was adopted and put into use in March of 1886, and since then the reports have been more full and accurate. Special blanks for reports on the sanitary condition, etc., of school-houses and their surroundings will be sent once, or, if that is found insufficient, twice each year with questions to be answered by the superintendent of schools in each county.

In lieu of the weather reports from county superintendents of health, which are but meagre and inaccurate at their best, Prof. Simmons, through the courtesy of General Hazen, of the United States Signal Service Bureau, receives monthly reports from Smithville, Hatteras, Fort Macon, Kitty Hawk and Wilmington, on the coast; from Knoxville, Tenn., which answers to the western part, and from Charlotte and Lynchburg, Va., for the central portion of the State. These, with the report of Prof. J. W. Gore, at Chapel Hill, and his own observations, taken at Wake Forest, make a total of ten stations in different portions of the State. These reports are full and accurate and give a very good general idea of the weather all over the State, though it would be much better could the number of stations be increased to two or three times the present number. Could voluntary observers be found, and we have no doubt there could, the money would be well spent were the State to furnish instruments for the establishment of twenty or twenty-five stations in different parts of the State for use by the Board of Health and Agricultural Department conjointly.

An attempt was made to obtain vital statistics from those counties reporting to the State Board, but it was found impossible to obtain them of any value as there is no law compelling physicians to report births and deaths, and I regret that this effort has shown that their interest in the welfare of the State will not cause them to give this information voluntarily. A complete and accurate registration of every marriage, birth and death is absolutely necessary to those to whom the health of a State, a county, or a city or town is entrusted, if they would effect any real progress in the science of public hygiene. The object and work of the Board of Health is to "take cognizance of the health interests of the citizens of the State;" to "investigate the causes of diseases dangerous to the public health, especially epidemics; the *sources of mortality;* the effect of locations, employments and conditions of public health;" and how can they do this without a complete registration of vital statistics? How can they "gather such information upon all these matters, for distribution among the people, with the especial purpose of informing them about preventable diseases" without such registration?

The health of its subjects and the average duration of their lives, is to every government a matter of the highest consideration. And to be indifferent to, or ignorant of the laws which affect human nature, would be to make the legislator responsible for the ravages of every preventable epidemic of disease. But how shall the legislator or government of our State be able to act intelligently or effectually in relation to public health? In no other way, we emphasize, is it possible than by an adequate knowledge of our vital statistics, to be derived alone through uniform and careful registration, by which not only are the causes of disease and death ascertained, but the proportion of death-rate to the population, and to the occupation of those who died—knowledge of no secondary importance.

A majority of the States have enacted laws requiring the registration of births, deaths and marriages, and in those States in which these laws have existed the longest do they meet with the most popular favor, as is evidenced by the increased appropriations which are cheerfully made for the perfection of these records.

The reports on public buildings have brought to the eyes of the community a disgraceful state of affairs in many counties in the State. Sanitarians place the proper amount of space per capita, for health, at eight hundred cubic feet; and with even this amount the ventilation should be such as to permit frequent renewal of the air. In the county jails it is the exception when this condition exists, in very many the number of cubic feet falling below half the requisite, and it has been known to be *below one hundred.* We are glad to state, however, that the efforts of the superintendents have, in several instances, caused the improvement of some of these conditions. The food and water served the inmates of jails and poor-houses have generally been reported good and sufficient. In many cases the buildings seem constructed only with a view to occupancy in summer, there being no adequate arrangements made for heating. By reference to the tables showing the condition of jails and poor-houses it will be seen that a much larger per centage of the inmates of the jails than of the poor-houses can read and write.

The condition of the jails throughout the State is much to be regretted, and the deaf ear which is turned to the suggestions of the superintendents of health, as to advisable and frequently necessary improvements, shows how essential is some State supervision of public prisons. There can be but little doubt that much of the disease, which renders unfit for the work they have to do the convicts sent to the State Penitentiary, and swells to such ugly proportions the death-rate among them, has its origin in the county jails in which these men—human creatures—have to be confined, their numbers increasing and their room proportionately decreasing, till the *welcome sentence* of the District Judge releases them from the living death to which they have been subjected, and sends them to the more sanitary surroundings in the Penitentiary.

An attempt was made to have each prisoner sent to the Penitentiary examined by the superintendent of health of the county from which he was sent, and furnished with a descriptive list to be given to the officer in charge of the Penitentiary. This list was to show the prisoner's condition at the time of his entering and leaving the county jail, and was to serve both as a guide to the Penitentiary officials in the disposition of said prisoner, and as a check on the county authorities for the treatment he had received while in their keeping. This attempt, however, proved an utter failure. In only two or three instances did the county commissioners order it done, and those who did would allow no extra fee to the superintendents, and the work being of such a disgusting and filthy nature, the latter were unwilling to perform it without some remuneration. At the regular meeting of the Board in New Bern a committee was appointed to confer with the Board of Directors of the Penitentiary, and get them to have a thorough physical examination made by the physician in charge, of each prisoner on his first arrival at the Penitentiary. This examination was deemed more necessary by the Board as it appeared from the reports of the physicians in charge of the stockades, copies of these reports being furnished the Board, that men were sent to the stockades in whom heart, lung, or other constitutional diseases in a more or less severe form already existed, rendering them unfit for the kind of work they were compelled to do. The result of this conference appears in the report of the committee.

During the past two years committees from this Board have made, upon invitation from the officers in charge, visits of inspection to the different State institutions and to the convict camps in the western part of the State. Reports of these inspections have been submitted to this Board and accompany this report. Copies were sent, at the time of the inspections, to the officers in charge of the different institutions and to the Governor.

At the meeting in New Bern, Dr. Richard H. Lewis read a paper on the "Care of the Eyes and Ears." This paper was stereotyped and 5,000 copies printed and distributed among the people of the State. The stereotyped plates are preserved so that, when necessary, any additional number can be issued at but slight expense above the cost of paper and press-work.

The Board has also published the 3d edition (1,000 copies) of "Sanitary Engineering," by Wm. Cain, C. E., which he kindly revised and enlarged during his summer vacation. About five hundred of these have been distributed.

In April, 1886, the Board commenced the publication of a monthly "Bulletin," which gives each month the nature of diseases prevailing during the preceding month in those counties reporting to the State Board; the condition of the jails and poor-houses in those counties; the meteorological reports from the ten stations in the State, and such other information and advice for the advancement of the public health as may come to the attention of the Board. On account of the smallness of our printing fund the size of this publication is much smaller than the needs of the people and the information which is constantly coming before the Board, and which should be given to the people, would suggest. The copies issued are also restricted to a much smaller number than should be the case, the number at present being but six hundred and fifty, and even with this small circulation, the printing fund will be more than consumed, and the Board will have to make good this deficit out of the appropriation, which is sorely needed for and should be devoted to other uses. But this information must be furnished the people, if the object for which the Board of Health was created—the instruction of the people in the science of public hygiene and the promotion of the health interests of the State—is to be accomplished; and small as it is, both in size and circulation, we feel convinced that much good has resulted from it, not only in the information it has spread over the State, but in stimulating county superintendents in their work, and in influencing the organization of boards of health in several counties where none existed before. We believe that in thus publishing the condition of public buildings, and bringing before the people the criminal neglect of and utter disregard for the health and comfort of the inmates of these institutions on the part of the county officials, much has been and will continue to be done in the improvement of these conditions.

The Board is gratified at the improved condition of the public health of the State during the past two years, very many counties reporting a better condition in that regard than for many years. No case of cholera, small-pox or yellow fever has come to the knowledge of this Board as having occurred in the State—imported or otherwise—and the special epidemic appropriation of two thousand dollars has not been touched. There is great need, however, of better facilities for the disinfection of vessels at the quarantine station at Smithville, and for the isolation and care of any cases of contagious disease which may be brought there. To accomplish this, there should be erected hospital accommodations for any cases of infectious disease which may enter the river on board of ships or steamers. At present the port of Wilmington is entirely without any means of caring for seamen sick with yellow fever, small-pox or cholera, any one of which diseases may be discovered by the quarantine physician at Smithville on incoming vessels. It is needless to say that the care of such sick persons cannot be had on shipboard, nor would it be humane to detain them on the vessel, at the risk of their own lives and the lives of those on the same vessel with them. The Marine Hospital, under the control of the United States government, cannot admit such cases to their wards, for evident reasons, and thus provision for any such emergency must be made by the State. The board of quarantine for the port of Wilmington need this help, and will be glad to suggest plans for buildings to meet the wants of the station. The ground for the hospital is already in the possession of the State; the buildings can be erected and made comfortable for a comparatively small sum. The plans for the hospital will include a keeper's house, a house for observation of the people taken from an infected ship and not sick at the time of their removal, two houses, or wards, one for small-pox and one for yellow fever or cholera, a small room for the disinfection of clothing and articles likely to carry the disease to the city of Wilmington and thence into the State at large, and a cistern for a supply of water sufficient for drinking, cooking and bathing purposes. There is also great need for a wharf at the station for the safety of vessels undergoing quarantine service of disinfection. The commerce of Wilmington is constantly growing, and the danger of the importation of disease is proportionately increased, as vessels enter the port from every quarter of the globe.

The present method of securing disinfection and cleansing of vessels is not equal to the demands that the quarantine authorities may be called on any day to meet, for the safety of the State as well as the chief commercial town in her borders.

At the regular meeting of the Board, held in New Bern, in May, 1886, Prof. W. G. Simmons made a partial report on "Illuminating Oils." He had not been able to complete his report, and asked for further time. His experiments on twelve samples of oil obtained from the retail dealers of Wake Forest, showed the class of oil sold there to be far below what is necessary for safety. Using the "Oil Tester of the New York Board of Health," he found several of these oils to "flash" below 100° F., he placing the minimum safety point at 112° F I quote from a letter just received from Prof. Simmons giving the names and "flashing points" of these oils:

"White C" flashed at.	118° F.
"Red C" " "	119° "
"Safety" " "	115° "
"Safety" (another mf'r.) flashed at.	117° "
"Security" flashed at	124° "
"Security" (another mf'r.) flashed at	130° "
"Astral" flashed at	118° "
Kerosene " "	99° "
" " "	95° "
" " "	99½° "
" " "	99° "
" " "	84° "

"I stated, at the convention at New Bern, that illuminating oils flashing at 112° F. or above that point (by the New York Oil Tester) were reasonably safe, and that I was prepared to recommend that the State Legislature be memorialized to prohibit the sale, within this State, of all illuminating oils having their "flashing points," by the Oil Tester of the New York Board of Health, below 112° F. I have since had no reason for changing this opinion or the proposed recommendation to the Legislature. Indeed, I think such legislation is becoming more important every year. Several of the northern and northwestern States have enacted penal statutes on this subject, and the result has been to cause the best and safest oils to be put on the market in those States, while the unsafe oils have all been sent to the States having no penal legislation on the subject."

He regrets that the press of business at the college has prevented the completion of his report in time to present to the Legislature. It will be read at the regular meeting of the Board, at Charlotte, in April, of 1887, and will appear either *verbatim* or in a condensed form in the "Bulletin."

The state of things found in Wake Forest would undoubtedly be found at any and every other point in the State. The fact that low-grade oils are crowded into this and other Southern States, being driven from most of the Northern States by the stringent laws which prohibit the sale of oils below a certain standard in those States, is so evident that it was made a matter for comment in a recent text-book on "Illuminating Oils."

It is true that many of the casualties from kerosene oil are due to carelessness, but I believe that three-fourths of these disasters would be prevented could these dangerous low-grade oils be kept out of the State. It is useless to try to prevent their sale by informing the people of their danger. As long as people can buy oil at ten or twelve cents per gallon, they will not pay twenty for it. Better would it be, if they cannot afford to buy the higher grades of oil, that they return to the primitive tallow candle and pine-knot, than that so many thousands of lives and so much property should be daily jeopardized by the use of this dangerous stuff.

I hope that the legislators of the State will, at an early date, carry out the recommendations of Prof. Simmons, and enact laws which will drive out from our borders this cause of most horrible death. It is a matter which affects us all, for if our neighbor is careless, we cannot feel ourselves secure, no matter how careful we be.

In January, 1886, circular letters were sent to the proper authorities in each county in the State, asking for the number of insane, in confinement or at liberty, on the 1st of January, 1886. Of the ninety-six counties to which these letters were addressed replies were received from only thirty-one, with the result as shown in the following table:

COUNTIES.	White.	Colored.	Total.	PLACE OF CONFINEMENT.
Beaufort	...	2	2	Poor-house.
Bladen	1	...	1	Not confined.
Brunswick	1	...	1	Jail.
Buncombe	2	...	2	Alms-house.
Caldwell	6	1	7	Generally at home—close rest'nt.
Chatham	14	3	17	Poor-house, 4; not confined, 13.
Cleveland	1	...	1	At home.
Columbus	2	...	2	Jail, 1; Poor-house, 1.
Cumberland	6	...	6	Poor-house, 5; Jail, 1.
Davidson	4	...	4	Jail, 2; Poor-house, 2.
Durham	1	1	2	Poor-house.
Forsyth	2	1	3	Poor-house.
Franklin	...	...	...	....
Graham	1	...	1	Morganton.
Greene	3	2	5	Not confined.
Guilford	...	...	...	....
Halifax	2	2	4	Jail, 2; Poor-house, 2.
Iredell	6	1	7	Poor-house, 4; not confined, 3.
Johnston	1	...	1	Poor-house.
Lincoln	6	1	7	Poor-house.
McDowell	2	...	2	At home.
Macon	3	...	3	Not confined.*
Mecklenburg	10	10	20	....
New Hanover	2	4	6	Poor-house.
Onslow	...	...	...	....
Person	9	5	14	Poor-house.
Rowan	3	...	3	Poor-house.
Rutherford	4	...	4	Jail, 2; Poor-house, 2.
Tyrrell	1	2	3	Not confined.
Vance	2	2	4	At home, 2; not confined, 2.
Yadkin	3	...	3	....
Number of counties.......31	98	37	135	

* Race not given.

Taking these reports as an average of all the counties, it would show that there are 370 insane in the State who are not taken care of by the State.

Seeing the necessity for prompt information of contagious diseases occurring in neighboring States, the International Conference of State Boards of Health, at Toronto, Canada, October 6th, 1886, adopted the following resolutions concerning "Inter-State Notification in Infectious and Contagious Diseases," which were also presented to and adopted by the American Public Health Association, on October 8th, 1886:

WHEREAS, It is necessary for the protection and preservation of the public health that prompt information should be given of the existence of cholera, yellow fever and small-pox; be it

1. *Resolved*, That it is the sense of the National Conference of State Boards of Health that it is the duty of each State, Provincial and Local Board of Health in any locality in which said diseases may at any time occur, to furnish immediately information of the existence of such disease to boards of health of neighboring and provincial States and to the local board in such States as have no State board.

2. *Resolved*, That upon rumor or report of the existence of pestilential disease, and positive definite information thereon not being obtainable from the proper health authorities, this Conference recommends that the health officials of one State shall be privileged and justified to go into another State for the purpose of investigating and establishing the truth or falsity of such reports.

3. *Resolved*, That whenever practicable, the investigations made under the preceding section shall be done with the co-operation of the State or local health authorities.

4. *Resolved*, That any case which presents symptoms seriously suspicious of one of the aforenamed diseases shall be treated as suspicious and reported as provided for in cases announced as actual.

5. *Resolved*, That any case respecting which reputable and experienced physicians disagree as to whether the disease is or is not pestilential shall be reported as suspicious.

6. *Resolved*, That any case respecting which efforts are made to conceal its existence, full history and true nature shall be deemed suspicious and so acted upon.

7. *Resolved*, That in accordance with the provisions of the foregoing resolutions, the Boards of Health of the United States and Canada represented at this Conference do pledge themselves to an interchange of information as herein provided.

As the water taken into our systems is second in importance only to the air we breathe, the water supply should be made the subject of careful study and examination by both corporations and individuals. It is to be regretted that our State is so backward in this matter of such vital importance to the health of her citizens. Articles on drinking water have from time to time appeared in the Bulletin, and the State has made provision for the analysis of suspected water by the State Chemist. Notwithstanding this fact, and though permits for analyses, with instructions for preparing and shipping samples of water, are furnished by this Board to any one making application therefor to the Secretary, only twelve analyses of water have been made under instructions from this Board during the two years just past. The subject of drinking water is one which is, and has been for some time, attracting the attention of sanitarians as one of the commonest and most persistent sources of disease and death with which we have to combat. In several epidemics of typhoid fever in Pennsylvania during the past year the cause was found, by careful investigation on the part of the Board of Health of that State, to lie in the contamination of drinking water, while in Massachusetts 393,000 cases of typhoid fever and 40,000 deaths were traced to the same source.

The President of this Board has undertaken to collect statistics in regard to drinking water in different sections of the State, with a view to reading a paper on this subject, at the next annual meeting of the Board, in Charlotte, and the Board hopes in its next report to show a greater extent of good accomplished in this direction than has been the case during the two last years. But the greatest amount of good in this matter cannot be accomplished until there is adopted some system of house-to-house inspection in every city and town in the State.

As illustrative of the work done in other States and the benefit to be derived from these inspections, I quote from the report of the Secretary of the Illinois State Board of Health:

"The sanitary survey of the State has embraced the examination of 300,000 houses and premises, in 395 cities, towns and villages in 96 of 102 counties in the State. These inspections embraced every material condition affecting health, individual and public—site of house; its age, material, ventilation, condition, especially of basement or cellar, of cess-pools, sinks, drains, out-houses, and water-supply; of the yard and stables, barns, etc.; the vaccinal status of occupants, the occurrence of certain diseases, etc., and resulted in disclosing, in 382 places from which reports had been received at the close of the year, a total of 474,831 defective conditions and nuisances prejudicial to health, of which number 441,503, or over 90 per cent., were reported abated or remedied at the close of the year. The total cost of these inspections is estimated at about $50,000 for everything except the work actually done or caused to be done by the householder, tenant or owner. In Chicago it was a little less than seventeen cents for each inspection, including pay of inspectors, wages of laborers, hire of teams, cost of disinfectants, printing, stationery, etc. The death-rate from the filth diseases in Chicago was reduced 15 per cent. last year, and the health commissioner, Dr. De Wolf, says: 'There can be no question that much of this decrease in the preventable mortality was due to the house-to-house inspection and kindred efforts which were made possible through the special appropriation in anticipation of cholera.'"

TREASURER'S REPORT.

DISBURSEMENTS.

1885.				
March	9	Stamps	$ 2	00
	20	Receipt book		50
	21	Copy of act relating to Board of Health	3	10
	22	S. S. Satchwell, expense to meeting in Raleigh	23	00
	22	R. L. Payne, “ “ “ “ “	24	00
	22	J. W. Jones, “ “ “ “ “	28	60
	22	R. H. Lewis, “ “ “ “ “	4	00
	22	Thomas F. Wood, “ “ “ “ “	25	00
	31	Secretary's salary 1st quarter, 1885	300	00
April	6	Stamps	4	00
	6	Fitting and furnishing office	125	00
	13	Stamps	2	00
	13	Express on stationery to members of board	4	50
	18	Stamps and postals	5	75
May	1	Stamps	3	25
	5	“	2	00
	13	Paper wrappers and stamps	2	55
	22	R. H. Lewis, expense meeting at Durham	19	55
	22	S. H. Lyle, “ “ “ “	34	95
	22	W. D. Hilliard, “ “ “ “	10	15
	22	R. L. Payne, “ “ “ “	16	95
	22	J. W. Jones, “ “ “ “	39	90
	22	W. G. Simmons, “ “ “ “	19	40
	22	Arthur Winslow, “ “ “ “	11	00
	22	Thomas F. Wood, “ “ “ “	39	00
	22	S. S. Satchwell, “ “ “ “	15	50
	22	R. D. Jewett, “ “ “ “	20	50
	29	W. D. Hilliard, inspection convict camps	25	75
	29	Thomas F. Wood, “ “ “	72	40
June	10	Postals		50
	10	C. W. Yates, for sundries	33	30
	10	Giles & Murchison, for sundries	1	45
	12	Freight on stationery from Raleigh		60
	15	Stamps and postals	1	75
	17	Telegrams	1	35
	30	Secretary's salary 2d quarter, 1885	300	00

July	6	Express on stationery from P. M. Hale	$	50
	18	Stamps and postals	5	83
	20	Express on map and stationery		62
Aug.	27	Stamps	2	25
Sept.	4	Stamps	1	50
	5	8 copies of “Sanitary Monitor,” $1.00	8	00
	5	2 “ “ “ Enquirer,” $4.00.	8	00
	5	E. & F. N. Spou's account	9	84
	5	8 copies “The Sanitarian,” $4.00	32	00
	5	Shaffer's map of North Carolina	10	00
	5	Post-office orders		52
	7	To supply 3 missing Trans. Am. Pub. H. Asso	15	10
	7	Arthur Winslow, inspection Asylum for D. D. and Blind.	32	00
	14	A. Winslow, inspection Western N. C. Insane Asylum	23	00
	14	R. H. Lewis, “ “ “ “ “	26	50
	14	Checks on New York to pay above		20
	16	Stamps	1	00
	17	Freight on stationery from P. M. Hale	1	65
	26	“ “ “ “ “ “		50
	26	Stamps	2	20
	30	Secretary's salary, 3d quarter, 1885	300	00
Oct.	8	Stamps	1	00
	12	Freight on stationery from P. M. Hale	1	45
	14	P. O. box rent	1	50
Nov.	6	C. W. Yates, sundries		95
	6	Giles & Murchison, twine		20
	6	Stamps	1	45
	30	Freight and dray, “Sanitary Engineering”	2	60
Dec.	4	Stamps	1	80
	11	Stamps	1	50
	17	T. F. Wood, expense Con. of State B'ds. of H	40	00
	17	J. W. Jones, “ “ “ “ “	25	00
	20	2 volumes “Trans. Am. Pub. H. Asso.”	10	00
	30	Secretary's salary 4th quarter, 1885	300	00
1886.				
Jan.	4	Express on package to Prof. Cain		45
	7	Postage “Sanitary Engineering”	8	70
	12	Stamps		75
Feb.	28	Stamps	2	15
Mar.	20	Stamps	1	25
	25	Freight on stationery from P. M. Hale		55
	27	Freight on books to A. Winslow		30
	30	Secretary's salary 1st quarter, 1886	300	00

April	7	Stamps	$ 2 00
	30	C. W. Yates, sundries	1 08
	30	Giles & Murchison, letter scales	4 50
	30	Building and painting book shelves	7 50
May	5	Stamps	2 00
	21	John McDonald, expense meeting at New Bern	22 75
	21	J. W. Jones, " " " "	29 25
	21	W. D. Hilliard, " " " "	64 00
	21	A. Winslow, " " " "	45 50
	21	W. G. Simmons, " " " "	25 00
	21	R. H. Lewis, " " " "	24 10
	21	R. D. Jewett, " " " "	17 60
	28	Stamps	50
June	16	Stamps	75
	16	Freight on "Bulletin"	45
	25	Stamps	1 00
	28	Freight on books to R. H. Lewis	25
	30	Secretary's salary 2d quarter, 1886	300 00
July	9	Stamps and postage on Bulletin	1 50
	9	J. W. Jones, inspection N. C. Insane Asylum	29 60
	9	W. G. Simmons, meteorological instruments	80 15
	14	8 copies of Sanitarian, 1886, $4.00	32 00
	14	Post-office box rent, 1886	3 00
	30	Freight on Bulletin and wrappers	1 00
Aug.	5	Stamps and postals	1 50
	13	Express on MS. "Care of Eyes and Ears" to Raleigh	40
	17	Stamps	1 00
	25	A. Winslow, inspection N. C. Insane Asylum	26 00
	27	Stamps	1 00
Sept.	13	Stamps	1 25
	20	Five copies Lamb Prize Essays (Am. P. H. Asso.)	5 00
	24	Stamps	1 00
	30	Freight on plates "Care of Eyes and Ears"	46
	30	Secretary's salary third quarter, 1886	300 00
Oct.	2	Freight on Bulletin	50
	11	Postage	1 19
	13	R. H. Lewis, postage, wrappers and freight for "Care of Eyes and Ears,"	50 00
	14	Westcott & Thomson, stereotyping "Care of Eyes and Ears"	132 45
	14	Sanitary Engineer (A. Winslow)	4 00
	14	Stamps	90
	20	Assessment Conv. State Boards of Health	5 00
	28	Stamps	1 50

Counties.	ber.	Names of Correspondents.
Buncombe	monia, typhoid	Dr. W. L. Hilliard, Asheville.
Burke		Dr. J. L. Laxton, Morganton.
Cabarrus		Dr. Robt. S. Young, Concord.
Camden		Dr. F. W. Ritter, Cor., Shiloh.
Catawba	ooping cough, htheria.	Dr. Geo. H. West, Newton.
Chatham		Dr. Jno. M. Manning, Pittsborough.
Cherokee	s, diphtheria, , typhoid fever.	Dr. J. F. Abernathy, Murphy.
Cleveland		Dr. J. C. Gidney, Shelby.
Columbus		Dr. Isaac Jackson, Whiteville.
Cumberland		Dr. W. C. McDuffie, Fayetteville.
Davidson	gh, diphtheria,	Dr. R. L. Payne, Jr., Lexington.
Durham		Dr. A. G. Carr, Durham.
Edgecombe		Dr. Julian M. Baker, Tarborough.
Forsyth		Dr. D. N. Dalton, Winston.
Franklin	y.	Dr. E. S. Foster, Louisburg.
Gaston	arial fever.	Dr. E. B. Holland, Dallas.
Greene		Dr. W. C. Galloway, Snow Hill.
Guilford		Dr. Ed. Lindsay, Greensboro.
Henderson		Dr. J. L. Egerton, Hendersonville.
Iredell		Dr. M. W. Hill, Statesville.
Johnston		Dr. J. G. Rose, Smithfield.
Jones		Dr. Rom. A. Whitaker, Trenton.
Lenoir	gh, typhoid fe-	Dr. F. M. Rountree, Kinston.
Lincoln	asles, whooping	Dr. J. M. Lawing, Lincolnton.
Macon	heria, pneu-	Dr. J. M. Lyle, Franklin.
Madison		Dr. Jas. K. Hardwicke, Marshall.
McDowell	nic.	Dr. J. H. Gilkie, Marion.
Montgomery		Dr. W. A. Simmons, Cor., Troy.
New Hanover	gh, scarlatina, yphoid fever	Dr. F. W. Potter, Wilmington.
Northampton		Dr. V. S. McNider, Jackson.
Onslow	gh.	Dr. W. J. Montford, Ward's Mill.
Pender	gh, typhoid and	Dr. W. T. Ennett, Burgaw.
Person		
Pitt		

Oct. 2

3

Nov.

2

Dec.

Approp

Balanc

Oct.	29	Freight on Reports of Michigan Board of Health to complete library	1 65
	30	Freight on bases for stereotype plates	35
Nov.	3	Westcott & Thomson, bases for stereotype plates	7 00
	3	Express on Bulletin	50
	3	Paste brush	20
	4	500 sheets cyclostyle paper	40
	8	Postage on Bulletin	42
	23	Stamps	1 00
Dec.	1	C. W. Yates	13 52
	2	Express and postage on Bulletin	75
	2	Office rent ending December, 1886, 10 months, at $5.00	50 00
	9	Stamps	1 50
	10	¼ cord wood and cutting	1 25
	16	Secretary's salary 4th quarter, 1886	300 00
	18	Freight on "Care of Eyes and Ears"	53
	24	Stamps	2 35
			$4,015 93

RECEIPTS.

Appropriation for year 1885	$2,000 00	
" " " 1886	2,000 00	$4,000 00
Balance due Thomas F. Wood, Treasurer		$15 93

TABLE SHOWING CONDITION OF POOR HOUSES FOR YEAR 1886,

IN THE COUNTIES REPORTING TO THE STATE BOARD OF HEALTH.

COUNTIES.	NUMBER OF INMATES DURING												AVERAGE NO.			Space in Cubic Feet Allotted Each Inmate.*	GENERAL REMARKS ON THE SANITARY CONDITION.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	For the year.	Vaccinated.	Which can Read and Write.		
Buncombe	22	20	20	20	30	26	26	23	22	22	20	26	23	20	17	742	Excellent.
Burke	†	†	†	†	‡	9	10	10	†	†	†	†	10	†	†	‡	Good.
Cabarrus	......	......	......	......	......	13	12	13	13	16	14	15	14	6	9	1,665	Good.
Camden	......	......	......	......	......	......	......	......	......	6	6	......	......	......	......	....	Very good.
Catawba	†	20	20	18	20	20	15	13	13	16	18	18	17	9	10	300	Buildings old. New ones contemplated.
Chatham	37	‡	38	37	41	42	39	30	30	30	30	30	35	13	‡	714	Good.
Cherokee	4	3	3	3	3	5	6	5	6	5	6	6	5	‡	‡	650	Good, except an insufficiency of air.
Cleveland	32	†	31	27	28	27	27	27	27	29	30	36	29	‡	5	591	Four cottages. Estimates for improvements have been made.
Columbus	8	8	7	6	7	6	5	5	5	6	6	6	6	‡	......	550	New building to be built soon, with latest sanitary impro'mts.
Cumberland	15	15	16	20	20	18	15	14	15	14	18	......	16	11	6	800	Excellent condition.
Davidson	18	19	19	19	18	20	18	23	18	18	16	16	18	‡	5	720	Good. Dietary has been improved, and a nurse provided.
Duplin	......	......	......	......	......	......	......	......	......	......	......	8	......	......	......	....	Good.
Durham	6	†	9	9	17	13	8	10	6	7	5	5	9	‡	‡	‡	Good.
Edgecombe	35	34	32	32	19	19	19	19	20	23	22	......	25	‡	‡	2,200	Excellent.
Forsyth	†	‡	16	16	14	14	18	14	18	14	†	......	16	7	4	904	Good.
Franklin	13	13	12	13	13	13	14	14	13	14	13	12	13	10	1	850	Very good.
Gaston	8	8	9	9	8	8	8	8	8	11	13	12	9	3	3	2,580	Buildings seven in number, and very comfortable.
Greene	4	3	6	6	7	5	4	6	6	6	6	6	5	4	2	1,800	A large, airy and roomy building nearly completed.
Guilford	†	†	34	35	33	‡	†	34	31	†	34	34	34	‡	‡	600	Good.
Henderson	6	9	8	6	6	6	8	†	8	†	†	......	7	6	2	1,500	Good.
Iredell	†	15	15	17	23	16	20	‡	15	†	†	......	17	‡	‡	554	Pretty fair.
Johnston	†	10	11	11	11	10	10	10	8	9	9	16	10	‡	‡	722	Very good.
Jones	6	6	4	4	4	4	5	†	5	5	5	4	5	3	......	980	All the houses, save one, in good condition.
Lenoir	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	....	
Lincoln	15	17	17	15	15	13	13	13	14	‡	14	14	15	‡	‡	609	The three buildings are unsuited for this purpose, being too small and too frail.
McDowell	12	12	12	10	10	10	10	12	10	12	10	11	11	3	2	435	Good condition. New building just finished.
Macon	......	†	......	......	......	†	......	......	......	......	......	......	......	......	......	....	
Madison	......	......	6	5	6	6	6	6	6	6	6	6	6	......	......	2,100	Good.

Montgomery	......	......	......	......	......	......	......	......	......	12	12	......	......	......	......	500	Good.
New Hanover	24	24	24	26	24	20	23	19	†	28	22	31	24	16	12	600	Good.
Northampton	†	†	†	†	†	‡	†	†	‡	‡	‡	†	......	......	......	‡	
Onslow	5	5	5	5	4	4	5	5	5	5	5	8	5	......	1	1,250	Good.
Pender	......	......	......	†	5	8	11	8	9	8	8	7	8	4	2	1,220	Building unsuitable, but only temporary.
Person	......	......	......	......	......	......	......	......	......	......	16	......	......	......	......	1,020	Fair.
Pitt	†	†	†	18	20	18	†	19	†	22	......	......	......	4	......	....	Good.
Polk	......	......	......	......	......	......	......	......	......	......	4	......	......	......	......	1,153	Needs improvement.
Richmond	†	†	10	10	10	10	10	10	10	12	12	12	11	1	2	1,650	Prison for lunatics needs improvement.
Robeson	9	8	9	9	10	10	10	9	9	9	9	8	9	‡	‡	600	Hardly comfortable in cold weather
Rowan	24	‡	23	21	20	20	19	17	17	20	27	30	22	‡	‡	400	Good.
Rutherford	23	22	22	22	24	24	24	†	24	26	27	24	24	‡	‡	960	Good.
Sampson	17	19	15	17	12	20	18	19	11	14	14	10	15	‡	‡	1,200	Very good.
Stanly	......	......	......	......	......	......	......	......	......	8	7	7	......	......	......	1,000	Very good.
Swain	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	....	The keeping of the poor is let out to the lowest bidder.
Transylvania*	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	....	
Tyrrell	5	3	4	5	3	3	3	3	3	4	4	3	4	......	......	11000	Good.
Union	27	23	12	15	15	14	14	14	14	14	15	16	16	......	3	2,000	Good. [in private quarters.
Vance	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	....	This county has no poor-house, paupers being provided for
Wake	†	†	†	†	†	†	†	63	55	†	57	......	......	......	......	‡	Good.
Warren	9	†	12	12	11	12	12	13	†	13	11	......	12	‡	‡	2,000	Very good.
Watauga	8	8	8	8	8	9	8	9	9	8	8	......	8	‡	‡	‡	Good.
Wayne	10	7	4	3	3	5	3	3	†	‡	5	......	5	‡	‡	825	Good.
Wilson,	†	†	23	†	†	†	†	†	22	‡	22	......	......	......	......	‡	Good. [poor are all in the care of private individuals."
Yancey	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	....	This county has no poor-house. The Sup't of Health says: "Our

*The smallest space reported during year is given.
†No report received.
‡Not given in report.

TABLE SHOWING CONDITION OF JAILS FOR YEAR 1886, IN THE COUNTIES REPORTING TO THE STATE BOARD OF HEALTH.

COUNTIES.	NUMBER OF PRISONERS CONFINED DURING												AVERAGE NO.			Cubic Feet Space Allotted Each.?	General Remarks on Sanitary Condition, Dec. 31, 1886.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Confined during the Year.	Vaccinated.	Which can Read and Write.		
Buncombe	27	16	16	15	30	25	14	9	9	11	18	13	17	14	12	542	Excellent.
Burke	a	a	a	a	b	3	4	5	a	a	a	.....	4	a	a	b	Good.
Cabarrus	......	......	......	......	......	4	4	4	4	2	......	2	3	.....	a	1,256	Not heated at all, and sewerage exceedingly bad.
Camden	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	....	No report on jail.
Catawba	......	4	3	4	1	2	......	......	......	......	10	8	3	1	2	438	Good. Repairs recently made.
Chatham	3	b	2	2	3	2	3	4	6	2	1	1	3	1	1	2,600	Good.
Cherokee	......	1	1	2	2	2	3	2	4	1	3	1	2	b	b	1,050	Kept clean and warm.
Cleveland	6	9	a	6	4	5	8	10	15	12	9	10	9	b	4	364	Improvements contemplated.
Columbus	3	4	4	3	5	6	5	3	2	2	2	9	4	b	2	729	Fair.
Cumberland	4	3	3	5	3	6	7	6	6	7	6	......	5	3	3	800	Excellent.
Davidson	7	12	4	4	7	7	7	7	5	11	13	3	7	......	2	842	Good.
Duplin	.....	......	......	......	......	......	......	......	......	......	......	1	......	......	......	450	Defective sewerage. Improvement contemplated.
Durham	15	a	8	13	7	6	7	8	18	2	3	4	8	b	b	561	Good.
Edgecombe	21	20	28	28	14	9	11	9	10	14	13	......	16	b	b	245	Excellent. [Except space.]
Forsyth	a	26	23	23	5	5	5	7	8	4	a	......	12	11	4	325	Good.
Franklin	4	4	6	4	3	5	5	2	4	7	3	6	4	3	1	700	Very good.
Gaston	9	12	7	5	4	8	10	13	12	7	7	7	9	1	3	585	Situation bad. Construction bad. No ventilation or proper [means for heating.
Greene	7	7	11	2	3	4	4	3	2	3	2	3	4	1	1	1,000	Improvement needed in light and ventilation.
Guilford	a	a	27	17	18	b	a	17	17	a	38	20	22	b	b	200	Good. [Except space.]
Henderson	7	5	6	5	4	5	5	a	5	a	a	......	5	5	4	3,600	Good.
Iredell	a	13	16	32	21	17	14	b	10	a	a	......	18	b	b	36	Pretty fair. [Except space.]
Johnston	a	16	6	5	5	9	11	18	7	8	10	13	10	7	3	115	Very good. [Except space.]
Jones	5	5	2	2	3	3	3	a	3	3	2	2	3	b	1	1,260	Excellent.
Lenoir	7	2	1	5	3	b	5	20	3	4	4	6	5	b	2	235	Good. [Except space.
Lincoln	4	4	8	2	4	4	5	5	9	b	5	5	5	b	b	856	Pretty good.
Macon	......	a	2	......	5	a	2	2	2	12	5	5	4	1	2	400	Good.
Madison	......	2	1	2	3	......	......	5	13	1	.....	5	3	......	......	224	Insufficient in size and supply of water-closets.
McDowell	3	5	4	9	12	7	4	2	3	5	6	6	5	2	3	400	Good.

Montgomery	......	......	......	......	......	......	......	......	......	2	......	......	......	......	......	500	Good.
New Hanover	16	24	26	*	......	......	......	......	......	......	......	......	......	......	......	......	
Northampton	a	a	a	a	a	b	a	a	b	b	b	......	......	......	......	......	
Onslow	2	3	3	3	4	3	3	5	3	3	3	*	3	......	......	1,200	
Person	......	......	......	......	......	......	......	......	......	......	2	......	......	......	......	1,120	Fair.
Pender¶	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	
Pitt	a	a	a	7	10	7	a	6	a	7	......	......	7	......	......	......	Good.
Polk	......	......	......	......	......	......	......	......	......	......	2	......	......	......	......	535	Needs improvement.
Richmond	a	a	11	9	11	7	6	5	6	11	11	15	9	3	5	643	Good.
Robeson	23	7	6	8	6	5	6	21	5	10	10	12	10	b	b	300	Imperfectly heated.
Rowan	17	b	13	15	2	5	5	7	7	7	7	6	8	b	b	1,200	Good.
Rutherford	4	1	1	3	3	6	8	a	6	6	5	5	4	b	b	855	Good.
Sampson	7	4	3	4	2	......	1	4	6	6	2	3	4	b	b	700	Very good.
Stanly	......	......	......	......	......	......	......	......	......	7	3	3	......	......	......	1,000	Very good.
Swain	......	......	......	......	......	......	......	......	......	1	......	2	......	......	......	559	Very bad, with no efforts at improvement.
Tyrrell	......	......	......	......	......	......	......	......	1	......	......	1	......	......	......	11,000	New and in good order.
Transylvania	......	......	......	......	......	......	......	......	......	3	3	......	......	......	......	b	Excellent.
Union	5	4	18	5	6	4	5	5	4	5	5	6	6	......	3	1,000	Bad. New one talked of.
Vance.¶	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	
Wake	a	a	a	a	a	a	a	16	18	a	21	......	......	......	......	1,200	Arrangements for heating defective.
Warren	11	a	1	4	10	10	5	9	a	7	8	......	7	b	b	700	Generally good.
Watauga	1	......	......	1	1	......	......	......	......	......	......	......	......	......	......	b	Bad.
Wayne	23	2	24	25	15	23	25	28	a	a	24	......	21	b	b	10	Very bad. Improvements contemplated.
Wilson	a	a	4	a	a	a	a	a	5	13	10	......	......	......	......	b	Good.
Yancey	......	......	......	......	......	......	......	......	1	1	1	2	......	......	......	b	Good. Bedding bad and uncomfortable.

*Jail burnt at this time.
a. No report.
b. Not given.
§This shows smallest space reported during year.
¶Has no jail at this time.

ANALYSES OF WATER FOR THE NORTH CAROLINA BOARD OF HEALTH,

Made by the Agricultural Experiment Station in Years 1885–'86.

Station Numbers.	MARKS.	WHEN RECEIVED.	NAME AND ADDRESS OF SENDER.	Grains per Gallon.		Parts per Million Ammonia.		REMARKS OF CHEMIST.
				Total Solids.	Chlorine.	Free.	Albuminoid.	
3307	Well of Charles Hines,	1885. May 1st.	Dr. Pritchard, Faison, N. C.	11.50	2.98	.48	.32	A bad water—one that may give trouble. The high quantity of ammonia present indicates some organic contamination, possibly owing to nearness of cess-pool.
3383	Taken in front of Boyden House.	July 14th.	E. B. Neave, Mayor Salisbury, N. C.	19.60	4.16	.16	.20	Chemical analysis does not indicate anything of a serious character. Still it may propagate germs of disease of which we have discovered nothing.
3408	No. 1, J. Private Well.	August 15th.	John C. Jacobs, Supt. Health, Henderson, N. C.	4.70	0.56	.186	.20	Somewhat contaminated with organic matter. Quite enough ammonia, etc., 10 admit of development of germ life, though I am not sure the contamination is animal.
3409	No. 2, B. B. Warehouse.	" "	" "	4.80	0.49	.08	.16	Slightly suspicious.
3410	No. 3, T. P. Public.	" "	" "	7.20	0.71	.0132	.15	Vegetable contamination. Suspect surface water runs into this one.
3534	Turnpike between Wilmington and Wrightsville Sound, 7 miles from Wilmington.	November 11th.	James C. Stevenson, Wilmington, N. C.	8.50	1.20	.00	.06	Very pure water.
4025	Well of self at Whiteville, N. C.	1886. August 30th.	A. F. Powell, Vineland, N. C.	(a) 4.40	....	......	......	Extremely small amount of dissolved matter of any kind. Very slight hardness. A pure water.

4086	B. Farm near Tarboro, N. C.	Septemb'r 17th.	Dr. J. M. Baker, Tarboro, N. C.	6.90	.66	0.0266	.05	Fairly pure water. Nothing to indicate any harm in this water.
4087	W. Spring near Tarboro, N. C.	" "	"	7.90	.44	0.066	.03	Free ammonia rather high, but otherwise as good as the average.
4088	P. Spring near Tarboro, N. C.	" "	"	8.90	.55	.48	.05	Odor of sulphuretted hydrogen on opening bottle. Why so much free ammonia in spring water? Can it be contaminated with manure leachings?
4089	Caker. Well in Tarboro, N. C.	" "	"	23.30	6.01	.0534	.04	Slightly suspicious. May be contaminated from animal sources, as there is too much clorine and free ammonia in connection.
4090	Sizer. Well in Tarboro, N. C.	" "	"	39.60	14.13	.0266	.04	Too much clorine—may possibly be of mineral origin, however. Look for source of animal contamination.

(a.) Solids consist of carbonate of lime and iron, and some chloride of sodium.

REPORT OF DR. J. W. JONES, PRESIDENT, ON THE NORTH CAROLINA PENITENTIARY.

CAPT. E. R. STAMPS,
President North Carolina State Penitentiary, Raleigh, N. C.:

By an invitation of the Board of Directors of North Carolina State Penitentiary, the North Carolina Board of Health sent to the Penitentiary a committee consisting of Drs. J. W. Jones and S. H. Lyle; Prof. W. G. Simmons and Arthur Winslow, C. E., to make a sanitary inspection, on May 22, 1885. The committee were impressed by the cordiality of their reception and the willingness of the officers to give them information that might in any way aid them in the discharge of their duties.

It is regretted that this report has been so long delayed. It was not for want of interest in the work.

The committee are conscious that they made a hasty visit to the Penitentiary, but entertain the belief that, by the aid which sanitary science affords them, and the assistance so cheerfully rendered them by the officers in charge, they have not greatly erred.

Many circumstances affect human life. Its fundamental laws connot be violated with impunity. In prison life, the arrangement of the prison, the air, the water, the hours of rest and labor, the quantity and quality of food, the protection from excessive cold and heat, are all big factors in health and disease, over which a watchful care and intelligent oversight must be taken, that knows no abatement. The air, water and food may be made unclean and unhealthy by the environment, the air and water taking up noxious gases and bad emanations that come from decomposition of matter, together with the food in its connection with the air and water when taken into the body to sustain it, become, at the same time, carriers and causes of diseases. Also good food improperly prepared, or not suited to the condition, may become a source of disease. The houses should be so constructed as to protect us against inclement weather and not permit the accumulation of foul air, and to have a sufficiency of pure air and light. The clothing should be of a sort to render us comfortable and to protect us from the excessive cold and heat, clean and dry. The hours of rest and labor should be ordered with a Christian vigilance.

The high death rate as reported by the President of the Board of Directors can only be accounted for by a violation of some one of these laws of health in the Penitentiary, stockades or county jails.

No facts or conditions are given in the report of the President of the Board which will account for the high death rate or enable the committee to advise in the matter from the report.

From the greater amount of sickness at certain stockades, as reported, it would seem that there are local causes operating at these points that produce disease, which the Directory would do well to have studied, in order that the causes may be removed.

We cannot too strongly urge the immediate consideration of Mr. Winslow's report, which please find herein. Foul air and noxious gases will surely cause disease and unfit the convict for the exposure and labors of stockade life.

For the better study of disease causation of the Penitentiary, it is suggested that the physician give in his report not only the number of cases of sickness of all kinds, but in addition the names of the diseases treated in the Penitentiary, stockades and farms.

It is hoped that we may devise means for a better sanitary condition of the county jails, which will relieve the Penitentiary of much of its sickness and mortality.

We are making efforts to have each convict sent to the Penitentiary furnished with a descriptive list by the County Superintendent of Health, showing the time he has been in prison and the state of his health. This is for the guidance of the Superintendent and Physician in the treatment and selection of labor suited to each convict. Respectfully submitted,

J. W. JONES, M. D.,
President N. C. State Board Health.

TARBORO, N. C., July, 1885.

REPORT OF PROF. W. G. SIMMONS ON THE NORTH CAROLINA PENITENTIARY.

To Dr. J. W. Jones,

President Board of Health of North Carolina:

The North Carolina State Board of Health accepted an invitation to visit the Penitentiary, and a committee, consisting of four members of the Board, made an official visit to that institution May 22d. The authorities extended every facility for examining into its condition and management.

The committee of the Board found that the convicts are supplied with an abundance of wholesome food, that the water is good and the water supply is fully adequate to every sanitary requirement.

The buildings are in good condition and all necessary attention is given to cleanliness in all the apartments, including the hospitals and cells for the convicts.

The cells are not as large as they should be; their capacity is only * cubic feet. This necessitates that extraordinary care should be given to the matter of ventilation, especially during the night, when they are occupied.

The attention of the authorities was called to this point, and they expressed an earnest wish to do all that could be done to obviate the difficulty.

The sewerage is defective and the traps are not all in safe condition.

As the water supply is ample, it will be an easy matter to correct this evil. The Civil Engineer of the Board will give his special attention to this matter at once, and as the authorities are in full sympathy with the Board, there can be no doubt that his suggestions will be readily complied with and that the danger from this source will be speedily removed.

Respectfully submitted,

W. G. SIMMONS.

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*Number of feet to be ascertained by the Civil Engineer and reported by him.

REPORT OF DR. SAMUEL H. LYLE ON THE NORTH CAROLINA PENITENTIARY.

To Dr. J. W. Jones,

President Board of Health of North Carolina:

Taken as a whole, the Penitentiary is in the most perfect sanitary condition of any building I have ever seen; still, there are some points to which it might be worth while to call the attention of the Board of Directors.

The cells contain only 265 cubic feet air space when empty, which is not enough unless changed very frequently, especially in the lower cells, where the air from the upper rows of cells settles by virtue of its weight. There should be some arrangement by which a strong current of air could be made to pass through the ventilating flues all night. This could be best accomplished by a steam or some other blower, arranged on the same principle, or if this is not used, a jet of steam allowed to escape into the flue, so as to produce a partial vacuum, would accomplish the purpose, but not so well. As the system of ventilation is arranged now, the lower row of cells is not safe.

The privies are all in good condition and the water-closets well nigh perfect, but in the bath-room in the basement, as at other points designated by Mr. Winslow, in his report, there are no traps in the sewer and water pipes, or if so, they are so far from the opening of entrance that they do not answer their purpose, allowing the escape of sewer gas into the bath-room and from thence into the other basement rooms. I recommend that the traps be placed immediately at the internal end of these pipes.

I have a great many other notes, but as Mr. Winslow and myself took the same, from this time on they will appear in his report.

Very truly, yours,

SAMUEL H. LYLE, M. D.

REPORT OF ARTHUR WINSLOW, C. E., ON THE NORTH CAROLINA PENITENTIARY.

RALEIGH, N. C., June 13, 1885.

DR. J. W. JONES, M. D.,
President N. C. State Board of Health, Tarboro, N. C.:

DEAR SIR: I herewith respectfully submit to you my report on the sanitary condition of the State Penitentiary, with particular reference to the plumbing, disposal of sewerage and ventilation of the buildings.

The report is necessarily general and incomplete, from the fact that I had not the time nor the power to make a detailed and thorough examination, and also because much which should have had personal inspection is hidden behind walls, beneath floorings, or is deep under the ground, and therefore many facts had to be taken for granted or obtained by inquiry from the officers of the institution.

The *plumbing* of the building, as far as I could observe, seemed excellent and in good order.

According to Col. Hicks's statement, the waste pipes from kitchen sinks, bath tubs, etc., are trapped effectively before entering the drain or soil pipes, thereby preventing poisonous sewer gases from escaping into the different apartments. The form of *water-closet* used is of a self-acting pattern, in which the basin is flushed through the action of a spring seat upon a valve in the supply pipe. The soil pipe is said to be properly trapped beneath the basin, and the basin to be provided with a ventilating pipe which leads to the top of the building; both necessary precautions. The method of flushing the basin, however, is to be objected to, if not condemned. Direct supply of water to *water-closets* from cisterns or mains from which drinking water is drawn, is universally condemned. The supply should always be from a separate flushing cistern. The rough diagram on next page represents the principle of the water-closet system in use at the Penitentiary.

The vertical water pipe connects directly with the large water tank on the top of the building and from this same pipe water for drinking, washing, bathing and water-closet purposes, is drawn directly and at different levels. Now, while there is pressure in this pipe sufficient to cause a strong outward flow through the water-closet supply pipe, when the valve is open, there would seem to be little danger to apprehend from this direct connection; but, should the efflux of water from the various openings below this level be sufficient to cause the maximum possible flow of water through this pipe at the existing pressure, or should the tank become empty at any time, then, when the water-closet valve is opened, there would be a suction through the supply pipe into the water pipe carrying back the stagnant and contaminated water and the poisonous gases. This is especially liable to occur in the upper stories where the outward pressure of the water is least and below which there is most liability of an exhausting demand upon the water supply pipe. And it is just at the upper levels, evidently, that contamination of the water would be most dangerous and far reaching in its effects. Though, ordinarily, the danger from this defect may not be very great, a small amount of such contaminated water would be very dangerous in cholera times, or with the prevalence of typhoid fever.

The location of the water-closets, especially in the hospital departments, is also to be objected to as too close to the bedrooms, and as with too direct a connection, only one door intervening, and this probably frequently left open. In the basement floor, between each two blocks of cells, and connected with them by four (4) doors, are the prison bath-rooms. These are furnished with iron tubs supplied with hot and cold water. The escape pipes are said to be all suitably trapped. In the centre of the floor is the opening of a large pipe which leads directly into the sewer pipe at a distance of two (2) or three (3) feet below the floor. This untrapped direct connection between the sewer and the cell compartments might seem a dangerous source of disease, and this it would be were it not that there is a strong downward draught through this pipe, which effectually prevents any sewer gases from flowing into the bath-room. This downward draught is produced by the action of a ventilating pipe, which runs from the main sewer up through the kitchen chimney flue to the top of the building. The heating of the air in this pipe causes a strong upward current of air, which produces an inward flow of air from all parts of the sewer. This is, however, entirely dependent upon the heating of the pipe, and should it at any time be allowed to become cold, especially in summer, a reverse flow of air would set in and the poisonous sewer gases would be poured out into the cell chamber through these openings in the bath-room floors. The sewerage flows out into the opening, just outside of the west portion of the wall surrounding the buildings, whence the water flows down through channels in the earth and over broken stone to an adjoining branch. The solid matter is largely precipitated here and arrested by the broken stone and forms a constantly increasing accumulation of filth. This, at present, is not noticed to produce any disagreeable effects, but with the completion of the buildings more closely adjoining this portion of the wall, and with the increase of this deposit, I cannot but think that it will prove a source of discomfort, if not of danger. I should advise the pipes being prolonged as far as the branch at least.

The *ventilation* of the rooms and cells in the buildings is by no means perfect. In the wash-room and shoe-shop no adequate provision is made for a sure supply of fresh air. The windows are opened and closed according to desire, and during the winter it is more than probable that they are almost entirely closed for the greater part of the time. Each cell is ventilated by means of two separate flues, which lead to the top of the building. As there are five (5) tiers of cells in each block, ten (10) flues open out over each column of cells near the roof. Eight (8) of these sets of ten (10) flues each are there run together and connected with a central flue, containing a steam coil, which, when heated, is intended to create an upward draught in these flues. The working of this system of ventilation seems, however, very defective. The steam coils are not kept heated all of the time, and thus in summer, when the walls of the building are cooler than the outside air, a downward current must set in, and even when heated the coils are so near the top of the flues that the short column of heated air is, under the most favorable circumstances, not able to produce a strong upward draught. As roughly tested by me a few days ago, a downward current was found to exist in these flues, while the coils were cold, and, after steam was introduced, a very slight change for the better was noticed, the air appearing to be nearly stagnant and fluctuating irregularly from a slight upward to a slight downward flow, according as any current of air happened to influence it. This is certainly to be strongly objected to, and though in summer, when doors and windows are open; sufficient fresh air may reach the prisoners without the aid of the ventilating flues, this backward draught makes the conditions worse than with no flues at all, for the gases and vapors from the night buckets are blown directly back into the cells, often around the prisoner's head, whose bunk is immediately over the opening. In winter, when fresh air has not such free access, these flues should do good work, in order to keep this compartment, containing as many as 160 sleeping men, in a healthy condition. The capacity of each cell is about 300 cubic feet. To maintain the air in a healthful condition with such a space, when occupied by one man, it should be completely changed ten (10) times in each hour. The ventilating flues are 9x5 inches in section. If the escape of the ventilated air is to take place entirely through these flues and equally through each, it should flow with an average velocity of at least 80 feet per minute. If the ventilators cannot be made to produce this rate of flow they should at least be perfected to the extent of never allowing a down draught to sweep back into the compartments the very gases which the flues are designed to carry off.

The *water supply* is chiefly derived from a reservoir occupying the site of the old granite quarry. It is fed by a large spring in the bottom. The water is clear and free from sediment, and the reservoir is open to the light and air, and is not rendered impure by any vegetable growth. The water is pumped from the reservoir to a tank on the top of the building, whence it is distributed through iron pipes.

Some of the drinking water is also taken from a well on the west side of the buildings, but both of these sources of water supply are remote from any possible sources of pollution. The heating of the buildings is effected by the steam pipes and hot air. It seems in all respects satisfactory. The air is taken directly from the outside, remote from any sewer opening, and is heated by steam coils. In concluding this report, I must apologize for my delay in preparing it. I have, however, been very much pressed with other work which demanded my prior attention, and I have devoted the very first available opportunity to this work. I am well aware of its deficiencies, but trust that you may be able to extract some information of value.

I am, sir, very respectfully, yours,

ARTHUR WINSLOW, C. E.

REPORT OF DRS. THOMAS F. WOOD AND W. D. HILLIARD ON THE CONVICT STOCKADES.

WILMINGTON, N. C., June 1, 1885.

The Board of Directors North Carolina Penitentiary:

GENTLEMEN:—In accordance with your invitation to make a sanitary survey of the prison camps under the charge of the State Penitentiary, the North Carolina Board of Health appointed Dr. W. D. Hilliard, of Asheville, and Dr. Thomas F. Wood, of Wilmington, to make the tour of inspection. Accompanied by Capt. A. D. Brown, of Wilmington, member of the Penitentiary Board, we visited the Balsam Station, in Jackson county, the Tennessee Station, the Nantahala Station, the Asheville Junction Station, and the Arden Station, in Henderson county.

As a result of this tour of inspection we beg leave to lay before you such suggestions as in our opinion would promote the health and working abilities of the convicts held by the State, and also to further their well-being. These two objects we have kept constantly in view. We will remark on the several stations in detail, and finally make such general observations as may apply to the entire convict system as seen by us in the western counties.

The Balsam Station is well located, and the quarters furnished for the twenty-eight men there we found to be in good condition, and the employment of the men—saw-mill work—of a kind to promote their health.

We found two men suffering slightly here from diarrhœa, but we had no opportunity of examining those at work. Upon the whole everything here was satisfactory.

The second station we visited was the one on the Tennessee River — miles from Charleston, in Swain county. Here we found accomodations for forty-seven men, in quarters located directly on the sloping shore of the Tennessee River. The camp is well located for drainage and water supply.

The food prepared for the convicts was examined and found to be of good quality. The corn-bread was specially well baked, and made of sweet meal, quite well bolted. This we believed to be much better than corn-bread usually consumed by the men who compose the large majority of the convicts. Flour bread was not a part of their diet, and would indeed not be a desirable article of food unless better prepared than is usual in camp.

The water supply is from a flume from the mountain, the water being conducted through the inside of the prison, the water going in sufficient volume and force when at its maximum to keep the fœcal deposits from the men well washed away. Drinking water is within easy reach through a hand-hole near the chimney, enabling a prisoner at will to get pure water. The ventilation in the prison is chiefly accomplished through the loosely laid clap-boards of the roof and through the large fire-places. The disadvantage of this, though, is that during rain storms the roof leaks quite freely. This is a general condition of all the prisons, and will be mentioned more in detail hereafter. The free use of whitewash in the quarters and prisons added to the general tidiness and sweetened the atmosphere of the prison. We did not have the opportunity of inspecting the prisoners in their quarters, as our visit was near midday, while they were absent at work.

The examples of untidiness which we discovered at the Tennessee Station were the dirty condition of the blankets exposed for airing, and the necessity arising, by reason of the night guards not being allowed to leave their posts, of making use of the ground in the rear of the prison to *relieve* themselves. We found here four convalescent patients, and no hospital supplies, not even to the simplest remedies in case of sudden emergencies. Upon the whole, this station was in a fair sanitary condition.

On Tuesday we proceeded to the Nantahala Station, — miles from Charleston. This camp is located on the Nantahala River, shut in by the mountains on both sides. It is a clearing of small area, and not nearly so favorable for a camp as the Tennessee Station, mentioned above.

We reached this station during a rain storm, and had the first opportunity of seeing the prisoners confined in their quarters. Neither the drainage, water-supply nor ventilation were very good.

This was owing to the natural disadvantage of the location. The prison is a large log house, loosely covered with clap-boards, admitting fresh air, or, rather, letting out foul air, but insufficient protection in the time of rain.

The bunks of the men are built in two tiers, about four feet from the ground for the first, and the second tier about three feet above the first. The bed sacks are filled with straw of varying degrees of cleanliness. The blankets were of good quality but not as clean as they should be. During the day of our inspection, the dampness of the men's clothing and blankets imparted a peculiar choky odor to the prison, the doors at the time being wide open. The cubic space of air allowed to each prisoner was about 230 feet.

The hospital building is also a log house, kept quite clean, and used also as a drug department. The number of patients confined there was 10. Of this number we will mention a few in detail:

Robert Williams, a colored man from Halifax county (No. 5766), is a dangerous lunatic, subject to violent fits of rage, imperiling the other convicts in hospital. We would suggest his early removal to the Goldsboro Asylum, or some other place of safety, as the means at the command of Dr. Schenck, the surgeon in charge of the station, are entirely inadequate. The calamity of a fire or homicide by the hands of this insane criminal is too horrible to contemplate, but are not at all improbable consequences of his detention there.

Jackson (5709) has several old fractures and one umbilical hernia, the sum total of his disabilities making him unfit for duty there.

Cradle (5716) needs a truss, but even when properly fitted (a matter not easy to do at this remote station) would not be of much use as a laborer.

John Summerville, a patient with an imperfectly united fracture, is a particularly unfortunate case.

His fracture, according to his statement, was discovered by Dr. Moore, the medical officer who preceded Dr. Schenck, but it was not treated skilfully, and a permanent lameness will probably result. Dr. Schenck has instituted treatment which promises success after a long time, but the service of the prisoner as a laborer is lost for an indefinite period.

The roofs of the hospital and prison were not tight enough, as mentioned above, but of the former building, orders were issued the day of our visit that it should be repaired.

Asheville Junction Station was visited on Thursday, the 28th of May. The prisoners are kept in a former brick warehouse, belonging to the railroad. The location is flat and difficult to drain. The roof is more secure against rain than in the other buildings, and has a false roof to permit better ventilation. Water is not easily obtained here, and the privy arrangements are not good. The floors were not clean, owing to the former storage and leakage of salt when the building was used as a warehouse, and because of the numerous rainy days. The bunks of the men are built as described at the Nantahala Station, and the bedding in fair condition, except as to the blankets, and there had been so much rain there was little opportunity to sun them.

The hospital arrangements here are defective, and especially there is a need of a proper privy. The very offensive bucket system, we were told by the medical officer in charge, Dr. Burgin, was the best they could do. The privy of the main prison, while separated by a door which can be closed, must of necessity allow foul odors to come into the prison and vitiate the atmosphere. The difficult question, how to construct a proper one, which would be entirely secure to prevent escape of prisoners and not foul the atmosphere of the prison, has not yet been solved. The water supply is very objectionable, and consisted of open buckets set about in prison. The impure air of a room where eighty-four men are confined, with not more than 350 cubic feet of air, doubtless vitiates the water, and by morning it must be unfit for drinking, and would likely, in some epidemic conditions of the atmosphere, cause serious sickness. This could be remedied, in absence of a good supply of brook water, such as they have at the Tennessee Station, by placing a couple of barrels of fresh water outside the walls and delivered on the inside by means of a spicket. The preparation of food here is of rather a better quality, owing to the skill of the cook.

On Friday, May 29th, we visited Arden Station, in Buncombe county. The prison here is a log house with clap-board roof. The floor in the prison was only partially laid, and the part uncovered by flooring, was damp, making it necessary to lime it pretty freely. The privy arrangements here are scrupulously well cared for, and hardly the slightest odor of urine could be detected. Owing to the prevalence of wet weather the blankets were not well sunned, as a matter of course.

The shed under which the prisoners ate was very tidy, and the tables clean and tidy, and the tin-cups bright and clean.

In the hospital, there were ten men sick, out of a total force of ninety-five, but this included injured men. The hospital quarters were cleanly, but must be choky and foul when the doors are shut and the "bucket" used by the sick. This, the surgeon in charge pointed out as a serious annoyance, and it was very evident.

The cooking apartments at Arden were clean and tidy, and all seemed to be under good management. The preparation of food was good, and of the same quality as we had seen at all the stations. We did not get an opportunity of examining the men in their quarters at Arden or at the Asheville Junction Station, much to our regret, as no adequate conception could be formed of the suitableness of quarters until occupied. We had therefore to take our observations at the Nantahala Station to serve us in estimating the fitness of the others.

We would not do justice to the Captains of Quarters, in charge of the quarters, if we did not mention their evident fitness for their positions, without an exception. Each one seemed to be correctly impressed with the necessities and wants of the convicts, to preserve them in the best health and working condition. Sobriety and industry we observed as marked characteristics, and firmness and moderation tempered with mercy, seemed to be the rule.

In this short sketch we fear we have not specifically detailed all that would be necessary for a correct comprehension of the condition of the State's convict camps, but without tiring you with further details we will set forth as briefly as possible such suggestions as we believe would maintain the convict force in the best state of health, to enable them to effectually work out their sentence at "hard labor," and at the same time to temper it all with mercy.

It is the State's interest as well as the prisoners' that the period of penal servitude should be attended with all reasonable means to insure the prisoners' health. Fresh air, good water, well prepared food in sufficient quantities, dry and comfortable lodging places, an amount of work proportioned to the strength of each convict, enable the prisoner to serve his time to the best advantage.

Prisoners are more difficult to maintain in a robust condition than any other like number of men living in crowded communities. So far from being well off with less than is needed for the same number of soldiers, for instance, they really need more. In the long run it is expensive to neglect or slight the prime necessities of life of the convict. A sick prisoner is an expensive prisoner. The suggestions which we have the honor to make are designed to promote the working qualities of the prisoners in the highest state of efficiency.

VENTILATION.

The ventilation of these log prisons could be improved and made tighter by having a false roof made. This would not lessen the security of the prisoners. Any ordinary mechanic could construct such a roof so as to prevent the slanting rain from driving in. This plan was adopted at the Asheville Junction Station.

PRIVIES.

It is a prime necessity that the privies should be kept scrupulously clean. A good stream of water is best when available. When it cannot be had the dejections should be received in barrels or boxes having a layer of copperas in them, the whole to be covered during the night with unslaked lime, and the barrels and boxes emptied as soon as the prison is cleared in the morning. The barrels should be taken to a sufficient distance from the quarters, and remotely from the source of water supply and the contents buried, and then the barrels thoroughly limed, and allowed to air to be used again at night, each prison having two sets of barrels.

THE URINE

Is a very serious source of annoyance in most prisons, and its management is of prime importance. A good arrangement is the one we noticed at Arden, designed by Mr. McMurray. This receptacle carries off the urine and catches the last drippings, the accumulation of which, from numerous prisoners, although small in quantity, can fill the air with stench in one night. If buckets must be used in the hospitals, they should be provided with covers, and a sufficient quantity of a saturated solution of copperas be placed in each bucket at night. But the bucket plan is worse for a hospital than for the prison where the well are confined.

THE BUNKS.

The arrangement of the bunks in all the prison quarters was objectionable. That is to say, they are in two tiers, and the ventilation of the lower bunks always faulty. Furthermore, the men coming in from work, with muddy feet, carry enough dirt into their bedding to sift through on the men below them. We would suggest that the bunks might be arranged differently, with little increased expense, so that they may have better ventilation, and the prisoners kept well in view of the guard. One plan would be to construct the bunks tier above and behind tier, as the seats in an amphitheatre. This would give space beneath to enable the men to keep the prison clean and really give more room to all. This arrangement would necessitate passage-ways through and around the bunks for easy access, and keep men from stepping in each others' beds. The accompanying sketch may better explain the design.

STOCKADE.

A stockade around the prison would add greatly to the health of the men. On Sunday and on rainy days, when the men are not at work, they are confined to the prison, and with a stockade they could be allowed an airing and more liberty, and be as completely under the eyes of the guard.

WET CLOTHING.

During the rainy season it is difficult to keep the men dry, and wet clothing is a source of sickness as well as a means of befouling the atmosphere of the prison. We would suggest that each gang of 12 to 15 men be provided with a fly tent, which could be taken to work every day, and in case of sudden rain, tent poles could be readily improvised, and tents pitched to protect the men and guards from the rain. It is the experience of the Captains of Quarters that sleeping in wet clothing is the source of much sickness.

HOURS OF DAILY LABOR.

Upon inquiry we found that the men were actually worked from 14 to 15 hours a day. That is to say, that from the time they left their quarters in the morning until they returned at night, that much time was consumed. Part of this, of course, was consumed in walking to and from the work. We suggest that this time should be reduced, so that the men get two hours at dinner and are not worked more than ten hours a day, and that on Saturday they be returned to quarters by 4 o'clock in the afternoon, to prepare for washing and bathing. As it is, the bathing of the prisoners is done on Sunday, and the prison officials are as busy on this day as any other. There is an undeniable physiological necessity for one day of rest, and it is applicable alike to prisoners and their custodians.

These observations on the length of day's work are founded partly upon personal examination of the general physical appearance of the prisoners, and partly upon our inquiries from the medical officers and other officials. The men had the appearance of anæmia—*i. e.* poor blood—although there were but few cases of a slight degree of scurvy. As the variety or quality of the food was not at fault, our inference was that the prisoners were taxed beyond their power of efficient work and reasonable endurance. We are well aware that prisoners are prone to impoverished blood, by reason of crowding together, and the utmost care should be taken that overwork should not be added to this other almost inevitable source of physical impoverishment.

THE FOOD.

The food is, in variety, sufficient. Mr. Troy supplies the men with potatoes, kraut, onions and cow-peas, as well as the substantials of corn bread and meat, to which he has wisely made preparation to add flour bread. If this is properly prepared, it will be a very grateful and sustaining article of diet. Badly prepared flour bread, such as one finds almost universally in the remote mountain country, would be a detriment. And this leads us to say, that more attention should be paid to the preparation of food. It would be economy to employ an expert cook, or take an expert cook and send him from station to station to instruct others in cooking. This is more especially a necessity as far as bread-making is concerned.

We highly commend the wisdom of giving the men cow-peas as an anti-scorbutic, and these alternated with potatoes and onions, kraut and pickle occasionally, will serve to prevent scurvy. The absence of this disease we attribute to such supplies now furnished the men.

We could not make this tour of inspection without noting how much depends upon the selection of competent medical men. These gentlemen are not only physicians, surgeons and hygienists to the prisoners, but they daily sit in judgment upon the difficult questions of right and wrong between the prisoners and their legally appointed custodians. These positions, therefore, require the very best men, at the highest price the State is able to pay, and it would be a serious mistake not to recognize this fact. We would like to cite an example, and this unfortunately not hypothetical:

A man complains of being sick and unable to work. He is taken to the doctor, who examines him, and not detecting an obscure heart disease, he pronounces him fit for work. The man is sent to work, but refuses on the ground of disability. He is reported as insubordinate, and is whipped and returned to work. For four successive times this refusal and punishment are repeated, when finally a closer examination by another and better skilled ear reveals the fact that the man has been unjustly whipped, because that he has a valvular inflammation of the heart, which prevents him violent physical exertion. As soon as it is discovered, the man is put in hospital for treatment. This illustration is not drawn to reflect on any one, but to make more apparent, if need be, the necessity of getting the best skill, at the highest price the State is able to pay.

In this tour of inspection we set out with the principle that it is not only humane and just to the State that her prisoners should be maintained in the highest condition of physical ability, and of course, conversely, that it is uneconomical to neglect any means calculated to promote their physical and moral welfare, therefore we take the liberty of presenting some of the matters which have occurred, and which, we believe, if followed out, will be of service to the management of the Penitentiary.

We here beg leave to acknowledge the courteous assistance rendered us by Mr. W. C. Troy and the gentlemen under him, and to commend their zeal in the work which the State has entrusted to them.

Very respectfully yours,
THOMAS F. WOOD, M. D.
ALEX. D. BROWN,
W. D. HILLIARD, M. D.

REPORT OF ARTHUR WINSLOW, C. E., ON THE NORTH CAROLINA INSTITUTION FOR THE DEAF AND DUMB AND THE BLIND.

REPORT ON THE SANITARY CONDITION OF THE STATE ASYLUMS FOR THE DEAF AND DUMB AND THE BLIND.

DR. J. W. JONES, M. D.,
President of the State Board of Health, Tarboro, N. C.:

DEAR SIR: I herewith respectfully submit to you my report upon the sanitary condition of the State Institutions for the Deaf and Dumb and the Blind, in Raleigh.

In the arrangement of discussion of the various subjects which make up this report, I will not attempt any rigid classification, but will first simply call attention to what I think is to be objected to, and to what I think can be improved in the sanitary arrangement of the different apartments which were visited during our tour of inspection, and will then offer my suggestions as to what methods and means had best be adopted in carrying out the proposed improvements.

The departments first visited were the school-rooms in the north wing of the building. I was particularly struck here with the insufficient means for ventilation which is provided in these rooms, when their size and the number of pupils occupying them at a time is considered. The rooms are about 21 feet long, 18 feet broad and 12 feet high. The number of pupils in each room varies from 10 to 20. As every room is provided with two large windows, there is probably little difficulty in keeping the air in a healthy condition during the warm spring and autumn months, when the windows can be kept open. But, during the cold months of the year, when, to prevent cold draughts of air, the windows must be kept almost entirely closed for the greater portion of the time, the supply of fresh air must be insufficient, in as much as 15 thousand to 30 thousand cubic feet of fresh air should be supplied every hour. But even with a thoroughly efficient system of ventilation, 18 or 20 is too large a number of persons to occupy such a room at a time. These rooms have each a capacity of about 4,500 cubic feet, and, as to insure good ventilation without harmful draughts, there should be *at least* 300 cubic feet of space per head, it follows, that even with the ventilation of the room perfected, not more than 15 persons should occupy it together for any length of time.

The school-rooms were formerly heated by open fire-places, but these are at present in disuse, and I noticed them in many cases to be closed. This, as far as ventilation is concerned, is to be regretted, as an open fire-place is one of the best of ventilators.

The school-rooms are in pairs running nearly the entire length of the building. In the partition between each two rooms two transoms are cut at about 7 feet from the floor. These transoms doubtless serve a useful purpose when it is desirable to establish a cool current of air through the rooms from one side of the building to the other, and when there is a great superabundance of air supplied to satisfy all needs. But in winter, when the supply of fresh air is scant and the air currents are slow, they may produce decidedly injurious effects, as, with certain conditions of the atmosphere, the supply of air to occupants of one room would be almost entirely the vitiated air from the other.

The large bed-room in the deaf and dumb department was next visited. This room is 45 feet long, 36 feet wide and 12 feet high, giving a total capacity of 19,440 cubic feet. It is open to the light and air on three sides and is provided with 10 windows and two open fire-places. Thirty-two girls sleep in this room, so that there is about 600 cubic feet of space to each occupant. No special provision is made for ventilation, but reliance is placed almost entirely upon the windows and fire-places to effect this. The former are so numerous that in most weather all the air necessary is probably admitted through and around them. But too much confidence should not be placed in this supposition. 47,000 cubic feet of fresh air should be supplied here during each hour. With no wind stirring outside there must be a very small influx of air into the room when the windows are closed, unless an indraught is produced by fires in the open fire-places.

Closely adjoining this large room is a small bed-chamber whose only connection with the outside air is through the portico in the rear of the building, which is now boarded in and is used as a wash-room and as a room for soiled clothing. The air supplied to this room must therefore be very impure, and it should not be used as a sleeping-room.

In the rear of the large bedroom, on the same floor, is the water-closet. It is separated from the bedroom by a large vacant room, which is used as a trunk and storeroom. The form of water-closet is the trough closet, consisting of a range of seats over a cast iron trough about 8 feet long. The trough is filled with water automatically to a depth of 3 or 4 inches by a regulator ball valve, and is discharged by an attendant at intervals during the day. The cistern supplying the water is used solely for this and for washing purposes, so that there is not much danger of harmful results arising from imperfect valves or from other causes which might produce contamination of the water in the supply pipe. The waste pipe is also properly trapped before entering the soil pipes. The latter, however, does not extend above the trough of the water-closet and open out at the roof of the building, so as to effect good ventilation, and this is a very serious omission. The form of closet is also bad. In all probability the foul matter often collects and stands for hours in the trough before it is discharged. In the course of use the trough becomes bespattered and coated with filth, and unless constantly flushed and scoured must generate continually noxious gases. This was very noticeably the case in one of the closets visited, where, upon lifting the seat after the escape of the water, the stench was unbearable. In the basement there are other water-closets and urinals of the same design, and open to the same objections.

In the Blind Department, which was next visited, the room used as a hospital was particularly noticed as being too small for its purposes (21 ft. by 16 ft.), and, like all the other rooms, provided with no adequate means for ventilation. It is separated from a large dormitory by only a single door, so that any contagious disease could easily be transmitted to the outside.

Closely adjoining the dormitories of this department are the wash and bath-rooms. The waste pipes from the tubs are not trapped, and lead directly into a "gully" at the foot of the building, or open out into the gutter on the roof of the portico, whence the water is conveyed by an untrapped pipe directly into the gully, and this pipe opens out at the roof of the portico directly opposite a window through which air reaches the dormitory. As the gully is provided with no special ventilating pipe, it is clearly evident that these waste pipes must act as ventilating pipes, and there is nothing to prevent the air from the gully rising directly through them up into the wash-rooms, or up the portico pipe, to be wafted into the windows. Only wash water and rain water flow into this gully, it is true, but the gully communicates through a large pipe directly with main sewer, and it is doubtful whether this is a trapped connection, though, as no objectionable odor was noticed in the gully, it probably is trapped. But beyond this trap, if it exists, I could find no ventilating pipe to the sewer to keep the air pure and to relieve the pressure in the trap. And as, in this case, the trap is liable to become unsealed, and as the gases which would then escape into the gully and rise into the chambers, or which, in any case, would diffuse themselves through the water of the trap, must be exceedingly foul, these connections between the gully and the interior of the building cannot but be regarded as probable sources of danger.

The boys' dormitory over the chapel is a large room 30 by 45 feet, and 12 feet high, and is provided with eleven windows and one door. It is occupied by thirty boys. In warm weather the supply of air is doubtless more than sufficient to satisfy the needs. But in winter all of the windows are kept closed, and as no ventilating flues are provided, the air must become exceedingly foul.

The large room over the kitchen, which is used as a dormitory for twenty-two boys, is open to the same objection, and its proximity to the kitchen must make it an unpleasant sleeping-room, even in warm months.

The drinking water for the Institution is supplied from a large well in the rear of building. It has all the appearance of an excellent water and is remote from any source of contamination.

RECOMMENDATIONS.

The proper method of ventilating any apartment or series of apartments is by no means a question which can be decided by a rule of the thumb. It is dependent upon the size of the room, the number of occupants, its connection with the outside air, its shape, mode of heating and lighting adopted, &c. The rooms which I consider as most in need of improved ventilation are the school-rooms. As already stated, during the warm months of the year there will be no difficulty in keeping the air of this, as well as of other rooms in the building, in a pure condition. In winter, however, when a large amount of cold, chilling air must be admitted into a crowded room, the question presents many difficulties for solution. My suggestions are, therefore, intended to apply for the cold winter months, when it is impossible to keep the windows open, and when the cold outside air is heavier than warmed air of the apartment. The new heating apparatus which is being put into the school-rooms is an ordinary steam radiator. When this is heated the warmest air of the room will be immediately adjacent to it, and there will be a column of heated air constantly arising from it. The *desideratum* is that the cold fresh air should enter the room in sufficient quantity without producing disagreeable draughts, should be heated, diffused through the room and allowed to escape.

I should advise, as the simplest effective method of attaining this result, that thin strips of wood be screwed or hinged on to the lower sash of each window, so as to project some three inches below it, and so as to fit closely to the sill and window frame. This will insure a constant opening for the admission of fresh air between the two sashes of each window, and the projection of the lower sash above the upper will cause the air to spout into the room in an upward direction, and it will become diffused and the chill somewhat removed before it settles down to the bottom of the room. Then, under the influence of the ascending column of air from the radiator, it will flow toward the latter, become heated in its turn, rise into the room, become diffused, and rise to the top of the room. To provide for the exit of the vitiated air, an open fire-place with a fire in it is one of the best contrivances. If these are closed in the school-rooms an opening should be made near the ceiling of the room about 8 inches square and leading into a separate ventilating flue, or into the chimney flue if no fire is built in it below the level of the ventilator. It is advisable that the point of exit for the air should be on the opposite side of the room from the point of entrance and from the radiator. The transoms between the rooms, I should advise, in any case, to be kept closed in the winter months when both rooms are occupied.

The sleeping apartments have already been mentioned as not being provided with any adequate means for securing good ventilation. Though the need of improvement did not seem so great in the case of these rooms, it would be wise to ensure a plentiful supply of good air, by making some such improvement as is above outlined for the school-rooms.

The water-closets in this building are, however, the most objectionable features. Their defects have been pointed out. The long trough-shaped receptacle should be removed and some modern form of hopper-shaped closet substituted. This closet should be well trapped in its connection with the soil pipe. It should be flushed from a separate tank used for this purpose only. There are many forms and patterns of good closets. The J. L. Mott Iron Works, of New York, manufacture a good form, and the "Sanitas" patent, of the Sanitas Manufacturing Company, of Boston, is inferior to none. The soil pipe of these closets should be extended above the roof of the building and should be open at the top to ensure good ventilation. All connections between the house and the sewer and gully should be carefully trapped, and the sewer pipe itself should be well ventilated through numerous openings and man-holes. The old idea that a sewer should be kept hermetically sealed to prevent the escape of foul gases is now exploded, and all engineers agree in recommending free connection between the sewer and the open air, so as to keep the air of the sewer as pure as possible. The sewer must, of course, be well constructed, with no bends and depressions to allow of the accumulation of filth, and it should be flushed with rain water as often as possible.

THE COLORED DEPARTMENT.

The colored department of the Asylum was next visited. The school-rooms are generally small, badly lighted, and with no special provision for ventilation. The bed-rooms are mostly of one size, 30 by 18 feet, and 12 feet high, and occupied by 10 individuals. There is one large dormitory, 20 by 70 feet, lighted by 11 windows, and accommodating 20 boys. They are all well lighted and must be plentifully supplied with air during the warm months of the year. But during the winter the windows are all kept closed while the rooms are occupied, as they are not heated in any way, and the air then must stagnate and become intolerably close. Some method of keeping the air of these rooms pure should be adopted, and to render this feasible, some system of heating the rooms should be introduced which will make the temperature of the air bearable.

The disposal of the garbage and sewerage of this department is, however, what most needs attention. At the time of the visit it was noticed that kitchen slops were thrown out over the ground, within 10 or 20 feet of the well from which the drinking water of this department is taken. This, if a constant practice, cannot but pollute the well-water and give rise to offensive odors.

The greater portion of the slops and kitchen scraps are, however, carried to the lower portion of the yard, near the woodhouse, about 50 feet from the main building, and are there dumped into a shallow trench. This spot was visited and this condition of things was found. The slops are thrown upon the ground inside of the fence and the fluids flow along a shallow gutter in the earth, under the fence, out into the street gutter on the outside. They are there supposed to flow off, but, in fact, owing to the defective drainage of the street gutter, they collect and form a long stagnant pool, which extends to within a few feet of a pump and well, the water of which is used by the residents of the neighborhood. And further, as if fully to insure the pollution of this source of water supply, a pig sty is located in the angle of the fence at the east end of the wood-house, and not more than 15 feet from the well. That this state of affairs is to be strongly condemned, goes without saying. Only the grossest oversight and neglect of sanitary precautions would allow it to remain, both for reason of the effect upon the residents of the vicinity through use of the water from the well and for reason of the foul gases that must arise from this ever stagnant pool of putrid water. The slop water from the kitchen should be run directly into the drain-pipe which leads from the building, through a suitable flush-pot and trap, while the solid scraps of house garbage should be carried away or burnt daily.

The privy arrangements of this department of the Asylum are also exceedingly bad. The privy is a separate out-house, some twenty feet back of the main building. The urinal discharges directly into the street gutter, and is provided with no water connection for flushing. The privy proper consists of a row of seats over some kind of a cess-pool (whether concrete, brick or earth-lined, could not be ascertained), which is supposed to connect directly with the drain pipe. However this may be, this cess-pool contains a large amount of stagnant matter, which is apparently always there, up to a certain level, at which it flows out into the drain. Offensive and dangerous gases are constantly arising from this collection of filth. The drain itself must be in an exceedingly bad state, as it is only flushed with water during time of rain, and must, therefore be well coated with the solid portions of the sewerage. Such sanitary evils should not be tolerated in any large town. If they cannot be entirely removed and improved apparatus put in, they should be periodically inspected, cleaned and purified with proper disinfectants, such as a solution of copperas or quicklime.

CONCLUSION.

The sanitary precautions recommended in this report will doubtless seem to many of questionable importance, to be mere schemes of a fault-finder, designed to correct imaginary evils. And the reasons for such criticism are easily seen. The results of defective plumbing or ventilating do not show themselves so immediately, or are not so easily traced back to the original cause for this connection to be always clearly seen by any one. Cause and effect do not stand in such unmistakeable and well defined relation to each other as they do when a man is prostrated by a brick. All the numerous links of such a complicated piece of machinery as a man generally intervene, and these further complicated by the influences of all his various habits, and of the various conditions which he is subjected to. One man may drink polluted water for weeks and months and suffer no perceptible ill effects, while another man may have an attack of fever from the same cause within a week or two; all being dependent upon his condition of health. A man may die from the effects of a bullet wound, or of a broken leg, simply because his general health had so suffered from defects in the sanitary arrangements of his house that his vital force is not sufficient or his blood is not in good enough condition for him to recover from what would be a comparatively slight injury to a healthy man.

The first effects of bad ventilation and impure air are headache and general debility, and constant occupancy of a poorly ventilated room, though not necessarily causing serious sickness, would certainly very much impair any constitution. The pale and sickly appearance of most of the pupils of this institution is doubtless largely due either to hereditary causes, to the disease which has caused their infirmity, or to their necessarily restrained life, but it is far from doubtful but what this debility is largely perpetuated by the confinement of the pupils for many hours of the day in the poorly ventilated school-rooms.

With these remarks I will conclude this report, hoping that you will pardon both its deficiencies and my delay in not preparing and sending it sooner.

Very respectfully yours,
ARTHUR WINSLOW.

REPORT OF DR. J. W. JONES, PRESIDENT, ON THE NORTH CAROLINA INSTITUTION FOR THE DEAF AND DUMB AND THE BLIND.

To R. S. TUCKER, *President Board of Trustees of the North Carolina Institution for the Deaf and Dumb and the Blind, Raleigh.*

On the 22d day of May, 1885, a Committee appointed by the North Carolina Board of Health at its annual meeting at Durham, consisting of Drs. J. W. Jones, S. H. Lyle and Arthur Winslow, Civil Engineer, visited the North Carolina Institution for the Deaf and Dumb and the Blind. The warm reception and hearty co-operation of the officers in charge of the Institution greatly impressed the Committee.

The President of the Board of Trustees of the Institution reports that there have been no deaths, but little sickness, and a reduction of twenty per cent. since his last report. This shows that the officers have been diligent and faithful.

The last report of the Physician of cases of sickness treated, and the report of the Engineer of the Board of Health, seem to show that there are local disease causations in the Institution that need to be investigated and removed.

There were under treatment during the last term, 441 cases of sickness, of which there were 11 cases of Pleurisy, 32 cases of Tonsiletis, 28 cases of Bronchitis, 16 cases of Pneumonia, 29 cases of Diarrhœa, and others which are usually considered preventable, and caused by exposure to cold.

Permit me to suggest that a better plumbing and ventilation, warmer eating, sleeping and bath-rooms might better this condition, and prevent much sickness in the Institution. In my opinion, your Physician has very properly called your attention to these subjects in his last report, and we urge the adoption of his recommendations.

In case of an epidemic of any kind, or of contagious disease which you may have at any time, there are no ways of isolating the disease and thereby of preventing its spreading, and being contracted by others. On this subject, also, your Physician's recommendations are eminently proper.

Sanitary science, as it goes on in its investigation of the laws of health, shows that these laws cannot be violated with impunity. A disregard of her laws brings disease, slowly it may be, but surely.

As our population increases and becomes more dense, increased efforts must be put forth to remove the constantly accumulating debris incident to a thickly settled civilized country. In institutions where there is a large aggregation of people in a small space, the care must be unremitting in removing all vegetable and animal matter before decomposition sets in.

The buildings should be so arranged that the inmates may have sufficiency of sunlight, clean water and pure air. The atmosphere is a great carrier, and permeates all bodies. So our bodies, our food and our water partake of its kind—good or bad. Water is the great solvent of nature, and readily takes up everything in contact with it in a soluble state. So all sources of water, as well as the ducts leading to or from them, should be studiously guarded from impurities. Also, impure air will make the water impure, and impure water will make the air impure. The sources of water are often rendered impure, and even poisonous, by impure surface water entering in through the earth, or running back into the wells or springs from some filthy sink near by. For some distance about the source of water, well or spring, absolute cleanliness should be observed.

Sunlight, the great source of life and motion, should not be shut out nor too much avoided, but its entrance so regulated that healing may be on its wings, and the weak knees and eyes be strengthened. It gives life and light. It dries and decomposes and cleans, and sets up currents of air that cool us and carry away the impure air and replace it with the pure and fresh air.

Prof. Simmons, one of the Committee, was not with us, and we feel the loss of his report.

We have the pleasure of submitting herewith the reports of Dr. S. H. Lyle and Civil Engineer Arthur Winslow. We cannot too strongly recommend a careful and considerate study of Mr. Winslow's report. On the state of the plumbing of the Institution depends very largely the health of the inmates. It is a matter of the very first importance. Mr. Winslow has done his work well, for which we thank him.

Very respectfully submitted,
J. W. JONES,
President N. C. Board of Health.

TARBORO, N. C., August 22, 1885.

REPORT OF COMMITTEE TO CONFER WITH THE BOARD OF DIRECTORS OF THE NORTH CAROLINA PENITENTIARY IN REFERENCE TO THE EXAMINATION OF PRISONERS.

RALEIGH, N. C., December 13, 1886.

J. W. JONES, M. D.,
President North Carolina Board of Health:

SIR:—Your Committee appointed at the last meeting of the State Board of Health in New Bern to confer with the authorities of the State Penitentiary in regard to obtaining better medical control of the convicts employed on work outside the Penitentiary, in the interests of humanity and with a view to diminishing the inordinate death-rate, would respectfully report:

We waited upon the Board of Directors of the Penitentiary at their regular monthly meeting in June and were received with politeness and treated with consideration and courtesy. Upon inquiry, we learned that the Physician to the Penitentiary, Dr. J. W. McGee, already made it a rule to examine every convict upon his admission, though he was not in the habit of examining critically the heart, lungs and urine of every case, but only those who complained or gave some other sign of being below par in health. We learned, however, that many convicts never entered the Penitentiary, but were sent directly to the railroads from the courts convicting them, so that they never passed under the eye of Dr. McGee at all.

We suggested that it would be best to have every convict sent to the Penitentiary before he was assigned to work, and that the Physician make it a routine practice to examine every case thoroughly, whether apparently sound or not.

A month or two later, the writer was summoned before the Board of Directors again, at the request of Dr. McGee, and the subject re-opened, no action having been taken by the Board in the meantime.

The practical difficulty in the way of having all convicts sent first to the Penitentiary was the expense. The writer then suggested that if the convicts could not be brought to the Physician to the Penitentiary, a competent man be required to go to them, making frequent visits to the camps, and employing the Assistant Physician himself, he being held responsible for the entire medical management, and paid accordingly. The Directors impressed your Committee as having the interest of the convicts at heart.

After a good deal of informal and desultory talk, your Committee came to about this conclusion:

1. That the convicts at one or more camps are not, or were not, properly treated, in all probability owing to the fact that they are under a dual government; the State furnishing the food, clothes, medicines, physician and guards, and the railroad the quarters and the *overseers.*
2. That the quarters are probably insufficient in size, thereby injuriously restricting the breathing space.
3. That the overseers are possibly, in some instances, brutal—overworking the prisoners.
4. That the physicians are not always competent.

All of which is respectfully submitted,

RICHARD H. LEWIS, M. D.,
For the Committee.

REPORT OF DR. RICHARD H. LEWIS, AND ARTHUR WINSLOW, C. E., ON THE WESTERN NORTH CAROLINA INSANE ASYLUM.

WESTERN INSANE ASYLUM,
MORGANTON, N. C., September 5th, 1885.

J. W. JONES, M. D.,
President North Carolina State Board of Health:

DEAR SIR:—In compliance with your instructions we spent two days in an examination of the sanitary condition of the

Western North Carolina Insane Asylum, and we respectfully submit the following copy of our report to the Board of Directors:

Considering the limited time and means at our disposal we cannot pretend to offer this as a complete scientific and technical exposition of the subject; but the examination which we have been able to make we deem sufficient to justify these general practical conclusions.

WATER SUPPLY.

The analysis of the water, made at the State Experiment Station, proves it to be of exceptionally good quality, which confirms our information that the source of supply is free from contamination. The minimum rate of supply is estimated to be 120 gallons per minute. We consider this ample for all present purposes. Owing, however, to a constantly growing incrustation in the supply pipe, the amount of water will probably be seriously diminished in the course of time. This incrustation is of oxide of iron, and we are disposed to regard it as a deposit of the iron held in solution originally by the water rather than as a product of the corrosion of the pipe. An analysis of a sample of the water taken at the Asylum shows it to contain carbonate of iron in solution. We think it probable that an analysis of the water at the source would prove it to contain a still larger amount. We suggest that this analysis be made, and if the supposition prove true, that all possible steps be taken to arrive at a method of eliminating this very objectionable element. The present supply of water, while ample, is, however, not found to be superabundant with the existing demands; and in view of the great sanitary importance of the unrestricted use of water, we would recommend that plans be considered for still further increasing the supply to meet the requirements of the new wing.

SEWERAGE.

We find nothing to object to in the construction and arrangement of the sewer and of the drain pipes. The ventilation of the latter was shown by a severe test to be thoroughly effective in preventing any possible introduction of sewer-gas into the apartments. As this ventilation is secured by the draught of the smoke-stack, and as the number of openings and the area to be ventilated will be largely increased upon the occupation of the new wing, we think it possible that the draught may not be sufficient, and it would be well to thoroughly test this question at that time.

With regard to the water-closets used by the patients, we have noticed that the floors and other adjacent wood-work are generally wet with urine, &c., and emit disagreeable odors. Recognizing the impossibility of enforcing cleanliness with this class of persons, we would recommend that the floors of all water-closets in the wards be covered with some hard non-absorbent material, such as tiles (as impervious to water as obtainable), which we think would be improved for this purpose by a soaking in oil. Also that the wash boards be removed and that the partitions between the seats be rested upon iron brackets not less than six inches from the floor. In fitting up the water-closets in the male department, we think that the plans could be advantageously modified by combining the urinal and slop-hopper, whereby the expense would be diminished and greater cleanliness insured by the frequent application of hot water, thus more completely removing the urinous deposits than could be effected by the use of cold water alone, as in the urinal.

VENTILATION AND HEATING.

The system adopted we regard as admirable, and if the proper precautions are observed they are well calculated to meet all the requirements. We note, however, an exception in the case of the clothes drops, which, in some cases, are not ventilated at all. To remedy this, we would suggest an adequate opening at the top and the introduction of a steam coil near the bottom, which would prevent the vitiated air from escaping into the basement and ascending through dumb-waiter and other shafts into the apartments above. Further, we would recommend that the flues leading from the drying-closets be completely shut off from all communication with the wards.

In view of the high and exposed location of the Asylum buildings, we think it would be a wise precaution to connect the finials with sufficient lightning-rods to protect them.

In concluding this report, we wish it to be understood by the Board that its brevity is due to the fact that only the above suggestions as to construction and arrangement have appeared necessary; to our confidence in the ability of the present management to recognize and execute any reform or improvements that may be needed in the future, and to the further fact that in the sanitary management of the Institution, as regards order, neatness and thorough cleanliness, we are unable to make any criticism other than a most favorable one.

We cannot forbear expressing our admiration of the beauty and completeness of the design as a whole, and in every detail, and of the substantial and thorough manner of its execution.

Our report would be incomplete if we failed to express our appreciation of the valuable assistance rendered us in making our examination, and of the courteous hospitality shown us by the Superintendent during our stay.

Very respectfully,
RICHARD H. LEWIS, M. D.,
ARTHUR WINSLOW,
Committee.

REPORT ON THE SANITARY CONDITION OF THE NORTH CAROLINA STATE INSANE ASYLUM.

I. HEATING AND VENTILATION.

The heating of the wards and other apartments of the building is effected by what is known as indirect radiation, which consists, briefly stated, in forcing air over steam coils into the building. The air for this use is drawn down a stack by a revolving fan, located in the boiler-house about 250 feet back of the main building. Thence it is driven through an air duct (about 7 by 6 feet in section) to the centre building, where it splits, half following an air duct under each wing, whence it flows through separate flues into the wards. As the time of our visit was in June, we were not able to judge of the effectiveness of the system. The officers of the Institution state, however, that it is defective in its operation, not supplying sufficient heated air in the winter to properly warm the wards. They are inclined to attribute this to the relative location of the fresh air stack and the fan, which, they maintain, tends rather to force air up the stack than to draw it down. The Board was not able to make a thorough examination of the fan or to test this question, but we think the conclusion a probable one. Also, the top of the stack allows of the admission of fresh air only on the north side through a lowered opening, and it is our opinion that this single opening is not sufficient to supply the fan. The object in making only one was, doubtless, to prevent the gases from the smoke-stack, which is some forty feet south of this, from being drawn in. This chimney is, however, some thirty feet higher than the fresh air stack, and we think that the east and west sides can be opened without any danger from this source. We would recommend that the efficiency of the fan, and the effect of the position of the fresh air stack, and of its openings, be carefully tested, and the defects remedied, so that a strong current of air can be forced into the building from the fan whenever needed. The efficiency of this fan is doubly important, for not only does it effect the heating of the building, but it is also the ventilator whence nearly all of the fresh air is derived in cold weather. That it should be up to requirements is hence imperative.

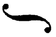
The fresh air duct leading from the fan to the building is about 250 feet long. It is seen that the air duct is directly over the sewer pipe and foul air pipes, and separated from them only by a plank flooring. The sewer pipe is of cast iron, and the foul air pipes of terra-cotta. Unless the former has been tested under hydraulic pressure, it is more than probable that it is not air-tight at a number of places, and gases must then escape from it and rise with the fresh air above. With the other pipe there is less danger of this, for though terra-cotta pipes are less likely to be air-tight than is cast iron, the air in it is always rarefied and the tendency is more to suck air in than for any to escape. These pipes should be separated hermetically from the fresh air duct. Further, in connection with this duct, is to be noticed that an exceedingly inflammable material lines both the top and bottom, *i. e.*, the two plank floorings; also the top one is in close proximity to steam and hot water pipes, which must dry it most effectively. Should a fire once start in this duct, aided by the draught from the fan, it would spread with terrible rapidity. If these partitions can not be removed and replaced by some non-combustible material, the danger of the spread of fire from the duct should be lessened by putting up fireproof doors, located so as to break connection with the building; and facilities for extinguishing fire should be at hand here, supplemented by automatic sprinklers on the cold water pipes.

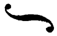
The branch air ducts leading under the two wings extend the entire length of the latter. They have a rough brick flooring, which could be made much less permeable to the vapors of the ground beneath by a thin covering of asphaltum. Along the bottom of the south wall of this duct are a number of small holes opening at regular intervals into an adjoining passage. The idea of these openings was, perhaps, that they should be avenues for the entrance of fresh air. With the pressure in the duct from the fan no air can, of course, enter through them, but, on the contrary, must escape by them, and doubtless accounts in part for the defective hot air current into the wards. These, and all other openings in the duct, excepting that through which the hot air is intended to flow, should be carefully closed. The steam pipes leading from the boilers to the radiators are nowhere packed. This should be done with some non-conductive material, and would result in increased efficiency of the radiators and in a saving of steam. There would also be less danger from fire. The radiators themselves are of an old pattern and could be improved upon. They are surrounded by a casing of wood, which is too combustible a material to be so close to steam coils. The hot air is carried from the radiators by separate brick flues to the different wards. Each ward has about 20 hot air flues with openings (about 12 inches by 10 inches) equally distributed. Provision for the exit of foul air is made by exit flues leading from the chambers out into the attic of the building. The location of the openings of these flues in the chambers is bad, generally about 5 or 6 feet from the floor, and in some cases at the level and near the head of a patient's cot. Inasmuch as the hot air is the fresh air and the cooler air the foul air, the exit flues should open from near the bottom of the wall. They should also be extended to above the roof and have free communication with the open air. There is no provision for drawing out the foul air other than natural ventilation, so when hot air is not being driven in, care should be taken to force a current of cool fresh air through the wards, or to keep the windows open. Some of the chambers were noticed to have no ventilating opening, which is very objectionable, as there can be no circulation of air in such rooms.

II. DRAINAGE AND PLUMBING.

The sewage and waste water of the Asylum is conducted from the building by a system of cast-iron soil-pipes and waste pipes, opening into one central sewer under the centre building. A prominent feature of the system is the method adopted for ventilating the soil-pipes and preventing the escape of noxious gases into the building. This consists in drawing air through the soil-pipes, from a point above their connection with the main sewer, the suction being produced by means of a stack inside of the boiler-house chimney, which is connected with the sewerage system by terra-cotta foul air pipes. With this method the tops of the soil-pipes are closed, and no trap intervenes between them and the water-closet hoppers, the downward draught through the latter being intended to prevent the rise of any sewer gas into the apartment. The effectiveness of this system is, of course, entirely dependent upon the heating of the boiler-house chimney: the higher its temperature the greater the draught. This chimney must, therefore, never be allowed to get cool. Further, as a chain will part at its weakest link, so will suction tend to draw air in along the line of least resistance, or through the nearest opening; therefore, the ventilation of the central or nearest pipes is apt to be accomplished at the cost of the remoter. The system has been condemned in the case of the Danvers Asylum, of Massachusetts, and of the Rhode Island State Asylum. The rough test made by the board at the North Carolina Asylum indicated, at the time, good ventilation, even at the remotest hopper, and therefore, as far as our observation went, we find nothing to object to in this respect. Any additional openings should be made, however, with great caution, as they may produce dangerous effects.

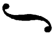
The water-closets in the wards consist of simple hoppers leading directly into the soil-pipes. They are flushed automatically from separate cisterns, at the rate of about one gallon every fifteen minutes, through a one inch pipe. The size of the service pipe and the amount of water are below the regulation amounts, but they seemed to be sufficient here. In the male wards, especially about the urinals, the floor, which is of oiled pine, is somewhat penetrated by urine, and is generally, with this class of people, evidently liable to be befouled. As a great improvement here, we would suggest that the whole floor of the privies, or, in any case, that portion surrounding the urinals, be made of cast-iron, slate, or laid with impervious tiles, sloping towards the soil-pipe, with a narrow drain and small exit pipe, so that the floors can, at any time, be liberally flushed with water.

The large sinks in the water closets empty into drain pipes leading into the sewer and are not ventilated. To prevent the escape of foul air through these sinks an  trap is introduced immediately below them. This is a necessary precaution, but to be effective it is further necessary that the drain shall either extend to and open out above the roof, or that the trap be ventilated.

The sinks used for slops in the dining-rooms lead, however, directly into the main sewer pipe without even an apology of a trap for breaking direct connection. The waste pipe extends upwards from the sewer through the different wards to the uppermost story, where it is cut off abruptly under the sink. The sinks open directly into this, so that there is not the slightest obstruction to the flow of sewer gas up through the pipe into the wards; in fact, with the heating of these tubes by hot water the conditions are in every way conducive to producing an upward current, and such current was noticed to exist where tested for. The remedy for this consists in extending the waste pipes to above the roof of the building, or leaving it open, and in inserting an  trap under each sink and one between the pipe and the sewer. Further, as grease is abundant in the water emptied into these sinks, a flush pot should be introduced beneath each. Such a pot is known as the Deuco. It consists simply of a pot with a conical base closed at the bottom by a valve which is operated by means of a rod extending through the strainer at the top. This pot is allowed to fill with water from the sink, and then the valve is opened and the whole contents rushes out with such violence and velocity that it effectively carries along all grease particles and thoroughly scours the pipe.

The waste pipes from the bath tubs in the wards are also noticeable, in that their connection with the sewer is an unbroken one. They should be trapped and ventilated.

Further is to be condemned unhesitatingly the drainage of the privies in the centre building. Here the hoppers, urinals, sinks and basins all open directly into the soil pipes without any traps, and the connection of the soil pipes and sewer is also unbroken. The ventilating current which draws out the foul air from the similar pipes in the wards has no connection with these, and does not extend its influence here at all; and the soil-pipes are not even extended to above the roof, but open out directly into the attic, at least in one case, so that these, with the hoppers and other openings, furnish the only and the most direct avenues possible for the escape of gases, whence they must diffuse themselves through this part of the building. This condition of affairs is to be strongly condemned. The remedies necessary are evident from foregoing remarks, and they cannot be made too soon. It is suggested to connect these soil-pipes with the foul air ventilating pipes of the wards. As already mentioned, this additional tax on the ventilating capacity of the hot chimney stack should be made with caution.

The sewage and wash water, after passing into the central pipe, is conducted along under the fresh air duct, as has been illustrated, to the extreme rear end of the building. Here, just at the door of the wash-house, the cast iron pipe ends, and connection is broken with the sewer beyond by a trap of square section. The location of this main trap so close to an occupied room, with only a plank covering, is bad, and in fact there is no need of such a trap at all. Main traps are only necessary for breaking connection between houses and foul sewers or cess-pools, and in the present case the sewer is so short and can be so easily flushed that there is no reason for it to become foul. The form of trap is also bad, it being in fact a diminutive cess-pool in which solid matter will collect at the bottom. If any trap here is thought necessary, it would be better to substitute a simple  trap, which will be washed clean with every rapid flow of water. In this case the pipe should be extended some 50 feet from the building and provided with a man-hole and opening for ventilation.

Beyond this main trap the sewage is conducted for some 200 yards in a brick-lined channel of square section, coated with cement and covered with loose stone slabs. Thence it flows into an open ditch which conducts it beyond the Asylum property and indirectly into a small stream which flows into Walnut Creek. Terra-cotta pipe would have been better than the brick channel, but the latter seems to fulfil the requirements. The open ditch is, however, bad, inasmuch as it has an irregular sloping and uneven bottom and is filled with a rank growth of weeds, which must arrest and collect much of the solid matter and promote putrefaction and the generation of poisonous gases.

Being located in a line southwesterly from the buildings, a direction from which the prevailing winds blow, this ditch is calculated to be a source of annoyance, to say the least. As a remedy for this, we would suggest that the flow of sewage be diverted from its present course in the ditch, that the fluid and solid matters be separated, by means of a filter or a tight cess-pool in which the solids will settle out, and that the fluids be used on garden or grass lots for manure when needed, and at other times be conducted by a terra-cotta pipe or other smooth channel down into Rocky Branch; the solid matter need only be covered regularly with ashes or dry earth and carted away or used in the garden. This change would result in a probable profit to the institution and in the removal of the source of nuisance.

III. WATER SUPPLY.

The water for washing purposes and for the flushing of hoppers, etc., of the Asylum is pumped into the building from a reservoir near by, which is fed from Rocky Branch, from a point about three-fourths of a mile north of the buildings. As regards the quality and quantity of this water, we find nothing to criticise. The supply of the building is, however, entirely dependent upon a single pump, which has to force all of the water from the foot of the hill to the top of the building. The pump is sufficient to meet the requirements, when it is in working order, but should any accident happen to it, or any of its parts wear out, the building would be entirely without a means of water supply, which, with its large sewerage system, would be a very serious matter. At present the engine cannot even be taken apart for an "overhauling." We consider it a very necessary precaution that the pumping plant be duplicated, as is customary elsewhere in similar cases.

The drinking-water for the Asylum is taken entirely from a well, located near the boiler-house, in the rear. An inspection of this reveals the fact that the well, which is 50 feet deep, is located within 15 feet of the main sewer trap, and only 6 feet from the sewerage conduit. This conduit, as has been already stated, consists of a square brick channel, coated with a thin layer of cement. From what we saw, we are of the opinion that the character of the work is such that the channel is by no means impervious to water, and it is highly probable that liquid sewage escapes from it into the soil. This being the case, there is nothing to prevent the percolation of these fluids from a considerable length of the channel through the soil into the well, with the effect of seriously contaminating the water. The two are certainly in dangerous proximity. An analysis of the water of this well, made at the State Experiment Station, in 1874, showed excessive amounts of chlorine, free and albuminoid ammonia, the presence of which is thus easily to be accounted for. We would earnestly recommend the changing of this source of supply of drinking-water, either by sinking another well, remote from the building or any contaminating influences, or better by using rain-water, stored in large cisterns, which would be located so as to distribute water in pipes to the centre building.

POSSIBLE SOURCES OF MALARIA.

There is no more thoroughly established fact in sanitary science than that disease is transmitted through drinking water. While malarial diseases have not been so systematically investigated in this connection as some others, notably typhoid fever, still, a sufficient number of facts are personally known to members of the Board of Health alone to demonstrate such a relationship. One instance will suffice to show the character of the facts referred to. In a town in the eastern part of the State there lived, side by side, two large families which happened to have exactly the same number of members, children and adults. One family drank well-water which was considered as good as any in the corporate limits, the other drank inferior cistern water—rain-water caught in old wine vats. The former suffered greatly from malarial troubles, the latter not at all. And this is no more than we would expect on theoretical grounds. Malaria, whatever it is, is of telluric origin; water is the most universal solvent; well-water is of the earth, earthy; cistern water is from heaven. In view of the above and of the further fact that the well-water used in the Asylum is not first-class drinking water, even according to chemical analysis, we think it most likely that there is to be found the cause of the malarial affections which have prevailed. It is, however, possible that the fish-ponds and the sewage distribution may not be innocent in this matter, and we would recommend that *all* of the basins of the former be kept either constantly filled with water, or better, if they are not a source of profit to the Asylum, that they be drawn off and the ground well drained.

Respectfully submitted,
J. W. JONES, M. D.
ARTHUR WINSLOW, C. E.
RICH. H. LEWIS, M. D.

REPORT ON DRINKING WATER OF RALEIGH, BY ARTHUR WINSLOW, C. E.

REPORT ON THE DRINKING WATER OF RALEIGH.

DR. J. W. JONES,
President North Carolina Board of Health, Tarboro, N. C.:

DEAR SIR:—I submit to you, herewith, a short report upon the nature and condition of the drinking water of Raleigh. It is necessarily short and largely compiled, for, with the means at our disposal, much time could not be devoted to original research. The definite facts which it contains, however, are, in my opinion, of value to the Board, and the collection of such facts from different towns in the State will put us in a position to criticise intelligently and specifically the sources of water supply throughout the State and to recommend the proper remedies where evils exist.

To this report I have appended a short paper on rain water and the construction of cisterns, which, I hope, will meet with your approval.

Very respectfully, yours, ARTHUR WINSLOW.

With two or three exceptions the drinking water of Raleigh is well water. These wells are either private wells, located within house lots, or are public wells, on the corners or sides of streets. These public wells supply a large majority of the people with their water; they are under the charge of the Street Commissioner, who sees to their being kept clean and properly walled.

The wells are walled with loose rock almost the entire length. Their average depth is between thirty and forty feet. One only reaches a depth of fifty-six feet. As a rule the top ten or twelve feet is in clay, and below this water-bearing strata of quick sand or porous gravel come in. Some wells have a rock bottom. About five or six feet of water generally stand in the bottom. With the public wells the top is cement-lined in many cases and the ground about prepared so that surface water will neither flow directly into them nor percolate through the soil.

In order to obtain definite facts concerning the wells of the town, over a hundred and twenty were visited and information obtained as to their depth, temperature and hardness of water, and their proximity to any source of contamination.

The following results were reported by Mr. W. Z. Blake, late Street Commissioner, who was engaged to make the inspection:

DEPTH.	NO. WELLS.
20 feet or less	16
Between 20 and 30 feet	32
Between 30 and 40 feet	52
Between 40 and 50 feet	20

DISTANCE FROM PRIVY OR STABLE.

DEPTH.	NO. WELLS.
50 feet or less	12
Between 50 and 100 feet	46
Between 100 and 200 feet	59
Over 200 feet	3

TEMPERATURE.

59° F.	18
60°	32
61°	32
62°	18
63°	20
Hard and not good	20

Full notes of the results of this inspection are retained, giving the location of each well. These will be of value for future use in the study of the distribution and character of well-water.

Fifty feet is certainly too short a distance for well and privy to be separated from each other, especially as a number of the above twelve wells are nearly as deep as this. The danger of contamination is, to a certain degree, offset by the fact that most of the privies are tub or dry earth closets. One hundred feet, with the clayey soil of Raleigh, may be considered a safe distance, but many of the forty-six classed under "between 50 and 100 feet distant," are only 60 or 75 feet away.

It is probable that the water of more of the wells is hard than are given in the list. Some are known to contain magnesia salts in solution, and have most disagreeable effects upon strangers, giving rise to diarrhœa, and sometimes to vomiting. These wells ought to be identified. As a rule, the well-water is considered good. Its quality varies, of course, with the weather; is apt to be clouded with sediment with heavy rains, and stronger in soluble salts after long dry spells.

It was not practicable to obtain analyses of water of our own sampling, but the following analyses had already been made at the Agricultural Experiment Station:

No.	Total solids in solution, grains per gallon.	Chlorine, grains per gallon.	Free ammonia, parts per million.	Albuminoid ammonia, parts per million.
1	8.2	.4	.13	.08
2	4.4	.2	.05	.08
3	19.2	5.2	.04	.02
4	8.0	.9	.06	.03
5	8.4	1.12	.058	.16
6	68.80	14.20	.00	.19
7	30.2	3.8	.016	.12
8	27.3	4.04	.026	.08
9	51.00	13.19	.026	.21
10	20.90	3.72	very small	very small
11	7.19	.44	none	none
12	1.3	.34	.692	.13

Taking two grains of chlorine per gallon, two parts of free ammonia per million, and one part of albuminoid ammonia per million, as the maximum amounts which a well-water should contain to be declared pure, we see that Nos. 3, 6, 7, 8, 9 and 10 are suspicious, and 6 and 9 certainly to be condemned.

No. 12 is the result of the analysis of melted ice from the factory. The high ammonia per cent. is doubtless to be attributed to the ammonia used in the process.

These well-waters cannot, however, be considered as representing the average Raleigh water, as a number of them are from wells whose purity was suspected. It is, however, probable that there are many others of the same character as these. The rough, preliminary sanitary inspection which we have been able to make proves, however, that there are few if any glaring instances of well contamination. Impurity of well water, if it exist, is due to either some hidden source or dissolved mineral matter which only analysis will reveal.

ON THE USE OF RAIN-WATER AND THE CONSTRUCTION OF CISTERNS.

BY ARTHUR WINSLOW, C. E.

In country places and small towns rain-water ranks among the purest and best for all household uses. Wherever there is any suspicion of the contamination of well-water, the rain should be collected from the roofs of buildings and saved. There is considerable evidence going to show that in many cases *malaria* is due to the character of the well-waters. Not only is rain-water a healthy water, but it is an exceedingly soft water, and therefore excellent for cooking and washing purposes, and, where a hard water is habitually used, the saving of soap through the use of rain-water will amount to a considerable item.

Rain-water is, however, not absolutely pure. Near manufacturing centres and in cities it contains soot and acid fumes, impurities washed from the atmosphere. Further, the accumulation of dust, leaves, etc., on roofs affects the purity of the water, and where saved, care should be taken to keep the roof as clean as possible. The character of the roof has also some influence, whether of new or old shingles, whether lead-painted or not.

Rain-water is collected in cisterns located sometimes near the top of the house and drawn off through pipes, or located in the ground and pumped out for use. When in the house the tanks are frequently of lead, which is, however, an objectionable material, as lead is often attacked, by soft and pure waters especially, and the water made poisonous. Galvanized iron, or, better, iron coated with coal-tar paint, is much to be preferred, is more durable and is cheaper. Stone-ware and slate are excellent materials in themselves, but the joints between the slabs should not be filled with red lead. Wooden receptacles are difficult to keep clean and liable to decay. Such tanks should be constructed so as to be self-cleansing, and should not have a direct connection through the overflow pipe with a cess-pool or drain.

Very often, however, and perhaps most generally here, cisterns are built in the ground. An essential of such cisterns is that they be impervious. Their dimensions vary, of course, according to requirements. The excavation should be dug square and about 9 inches deeper than the bottom of the cistern is to be, and about 8 inches clear of the side walls. Then, the entire bottom of the pit, which should be smooth and hard, is covered with damp clay about 6 inches thick, well compacted. Over this a layer of hydraulic cement, an inch or more thick, is spread and allowed to harden. Upon this the bottom bricks of the cistern are laid in fresh cement mortar and over these again a layer of cement spread about half an inch thick. In wet, soft or loose ground a plank flooring beneath the cement and bricks may be necessary. Upon this foundation the walls of the cistern are built of brick laid in cement mortar. With the progress of the wall the outside should be coated with a layer of cement, and, as this hardens, clay should be rammed into the space behind. The walls should be extended to about a foot above the ground, and near the top two or three openings should be left on each side for the admission of air, and covered with a grating or wire netting. Also an opening at a lower level than these for the escape of overflow. The entire inside surfaces of the walls should next be coated with a smooth, thin layer of cement. The top should be roofed over and the pump introduced through the roof, the pipe of which should extend to within about a foot of the bottom. Cisterns should be cleaned out certainly once every two years. To secure a supply of water during such time of cleaning, and for other purposes, it is desirable to divide the cistern into two compartments of unequal size, by a brick wall laid in cement mortar and made impervious by a coating of cement. This wall is built about 18 inches lower than the others, and the water, being introduced about 2 feet from the bottom of the first and another compartment, rises and overflows the partition into the second. In towns or other places where rain-water contains impurities, it should be filtered. Animal charcoal is one of the best filtering materials, and others, such as carbide of iron, spongy iron, etc., are used. But probably the most easily obtained is gravel and coarse, clean sand, which are all sufficient for the purposes in view. A wood grating or platform with holes or narrow slits, is built across the larger compartment 2 feet or more below the top of the dividing wall. Upon this, perforated tiles are spread, in close contact, or, if these are not available, a layer of porous brick, laid dry, will answer. Upon this 3 or 4 inches of gravel of uniform size and then some eight inches of coarse sand which has been washed free from clay, are spread, and then another layer of perforated tile, porous brick or a sheet of punctured, tar-coated iron is laid, with a slight slope from the dividing wall, which will prevent the overflow from the first compartment from washing out the sand and will distribute the water well over the filter. By this arrangement, the heavier compartments settle out in the first compartment and the finer particles are arrested on the filter, and as the water is drawn off below, the sand has opportunity to dry and to absorb air, which is essential for it to retain full efficiency as a filter. As it becomes clogged with sediment the top layer must be scraped off and at intervals it will be necessary to remove all of the sand and replace it by a fresh supply. When difficulty is experienced from vegetable growth upon the surface of the sand, or from freezing in winter, the filter must be lowered so that it will be almost always covered with a foot or two of water.

CAPE FEAR RIVER AS A SOURCE OF WATER SUPPLY.

THOMAS F. WOOD, M. D.

Southern river water of the type of Dismal Swamp water—water of a clear yellowish hue, known also as juniper and cypress swamp water, stained by flowing through a peaty soil, has for a long time been held in high esteem by masters of vessels for supplies for long voyages. The current belief is that this water after long storage in casks and tanks undergoes a process of rectification which insures its keeping properties indefinitely.

It is the purpose of this paper to set forth the experiences in the employment of a water of the Dismal Swamp type, taken from the north-east branch of the Cape Fear River, as a source of public supply, covering observations extending over a series of years. The Clarendon Water Works has a pumping station on the east shore of this river, from which is taken the water which supplies the city of Wilmington.

It will be necessary to give a brief description of the North-east River, in order to get a sufficient knowledge of the character of this water. This river rises in Duplin county, and in its course flows through a country only a few feet above the sea-level. It drains an area of about 1470 square miles, comprising the counties of Duplin, Pender and New Hanover. The river and creeks tributary to it have swampy margins, draining cypress swamps of large extent. Cypress swamps are not exclusively wooded with cypress trees, as the name would imply, but pines (*Pinus resinosa*), black-gums (*Nyssa*), sweet-gums (*Liquidambra styraciflua*), and dense undergrowths of smilax, andromedas, ilexes, also abound. One of the largest tributaries—Smith's Creek and its branches—has its source about five miles from Wilmington. The river is about 450 feet wide at the pumping station of the water works. The tide rises to a point 40 miles beyond Wilmington, making in all 75 miles from the ocean. The average rise of the tide at the station is 3.75 feet. Directly opposite the pumping station, and for 500 yards below it, tide-water rice-fields skirt the river down to Point Peter, the junction of the north-east with the north-west or main branch of the Cape Fear River. Above the station two other rice-fields are located, deriving their tidal irrigation from the river.

Wilmington is located on the east side of the Cape Fear River proper, with a water-front of two miles. The town is built upon a series of sand dunes, with intervening brooks, the natural drainage, and most of these streams have been converted first into partially-covered drains, and finally made to serve the double purpose of drains and sewers. These discharge their contents into the docks along the river front. The sewer which discharges nearest to the pumping station is ——— distant. The number of sewers discharging into the river front is ———, and the number of families using these sewers ———, and in addition to them two small hotels. The drainage of the east side is accomplished by a series of open ditches and natural streams. These streams and ditches eventually empty into Smith's Creek, a tributary of the Northeast River. On these streams are located four cemeteries, in varying degrees of proximity, and one or more slaughter-houses. By the course of these streams about one-half or two thirds of the town is engirdled, and the natural course of drainage east and west is directly or indirectly into the Cape Fear or its tributaries.

Cape Fear River water has been studied from many points of view, but not systematically, because the business interests involved were by no means identical with the sanitary interests.

SOURCES OF CONTAMINATION.

The amount of sewage matter which is emptied into the Cape Fear River has never been made apparent by chemical examination of water taken at the pumping station. The following table of analyses made, while small, may be taken as an average of the albuminoid ammonia and chlorine. The analyses were done at the Agricultural Department of the State, after the Wanklyn method.

TIME.	TOTAL SOLIDS. Grs. per gallon.	CHLORINE. Grs. per gallon.	FREE AMMONIA. Parts per Mill'n.	ALBUMINOID A. Parts per Mill'n.
1881.				
Feb. 24.	6.2	0.6	0.05	0.26
1882.				
Aug. 30.	9.10	0.52	0.014	0.50
Aug. 30.	11.10	0.53	0.04	0.36
Sept. 18.	6.70	0.23	0.08	0.48
Sept. 18.	10.60	0 69	0.24	0.24
Sept. 18.	7.40	0.29	0.08	0.40
Nov. 21.	6.90	1.31	......	0.10
Nov. 21.	7.50	0.49	......	0.20
Nov. 21.	9.60	0.45	......	0.46
Nov. 21.	8.20	0.48	......	0.42

Sewage contamination may almost be excluded by the above showing, and the nitrogenous element, as small as it is, may be accounted for by the decomposition of vegetable matter. One source of vegetable decomposition is from the discharge of water from the rice-fields during the "short" and "long flow."

The "short flow" is the technical name for the flooding which is first employed for the germination of seed. The water is let in through flood-gates at high tide, so that it covers the rice about four inches, and kept in this state until the seed germinate. The "long flow" is the admission of water in the same manner as above, and is intended to kill the grass after the first hoeing of the young rice. The water is just deep enough to hasten growth and decomposition under the influence of early spring sun, and consequently a large amount of water laden with the products of decomposition is discharged into the river. Another washing is resorted to, by admitting one tide into the rice-field trunks and ditches to give them a thorough cleansing. The soil of tide-water rice-fields consists of deposits brought down by freshets from the hill country, which have been deposited layer by layer. It consists largely of organic matter, and supports a very rank growth of grasses, sedges, and succulent aquatic plants, such as sagittaria and orontium.

FACTORIES.

There is no pollution from factories along the river front, the gas-house being the only establishment which discharges its contents into the river. Sulphuretted hydrogen has been discovered in the river opposite Castle Street dock, at which point the gas-house is located.

TAR, CRUDE TURPENTINE AND SPIRITS OF TURPENTINE.

These articles may not be classed under the head of contaminating agents, but may prove a source of perplexity, as will be shown further on. For a century the products of the pine-tree have been shipped from this port, and by the accidents of handling and shipping an unnumbered amount of barrels have been lost in the river. Of these, tar and crude turpentine are most tenacious when sunk in the river-bed of mud to the depth of twenty to thirty feet. The abundance of the accumulations of these products in the river may be illustrated by the following simple experiment: On a calm day in summer, if a pole be shoved deeply into the mud and the mud stirred, very soon there follows a play of iridescent film upon the surface, emitting a distinct odor of tar and turpentine. These matters, if at all noxious or noisome, are fortunately insoluble.

THE TEMPERATURE OF THE WATER AND ATMOSPHERE.

The purity of river water must be largely influenced by the variations of temperature, and especially do high temperatures promote decomposition and increase the solvent power of water. Mr. John C. Chase, Superintendent of Clarendon Water Works, has kept the record of the temperature of the water and atmosphere. The lowest temperature of water was February 21st, 43° F., the atmosphere being the same day at the lowest, 33° F. The highest temperature attained was July 23d, when the water registered 83° F., and the air the same day 96° F. This was the highest temperature of the air for the year, although there is a higher record for water—viz., 86° F., twice in August.

TABLES SHOWING RELATIVE TEMPERATURE OF AIR AND WATER AT THE PUMPING STATION OF THE CLARENDON WATER WORKS, FROM MARCH 1, 1884, TO NOVEMBER 23, 1885. TAKEN AT 12 O'CLOCK.

	1884. March.		1884. April.		1884. May.		1884. June.		1884. July.		1884. August.	
Date.	A.	W.	A.	W.	A.	W.	A.	W.	A.	W.	A.	W.
1	43	48	78	60	79	63	75	75	82	79	86	83
2	45	49	76	60	84	64	74	74	78	78	82	82
3	50	49	43	61	83	64	79	73	86	78	88	82
4	40	48	48	60	86	65	83	73	79	78	79	81
5	65	48	70	60	87	66	85	73	86	78	88	82
6	67	49	64	61	86	66	86	74	86	78	80	81
7	68	49	66	61	84	67	85	74	86	78	87	81
8	76	50	74	61	88	68	86	75	81	77	86	81
9	72	50	57	61	80	68	82	75	83	78	79	80
10	46	50	58	61	78	69	84	75	86	78	76	80
11	70	51	58	60	86	69	84	76	75	77	78	79
12	74	51	65	60	81	70	83	76	88	78	81	79
13	49	50	67	61	87	70	84	77	96	78	76	79
14	52	51	66	60	88	71	78	77	91	79	82	79
15	52	51	62	61	76	71	77	78	92	80	83	78
16	58	52	80	62	78	72	78	78	93	80	85	78
17	68	52	68	62	76	72	79	78	85	81	82	78
18	65	53	72	63	82	72	87	78	89	81	83	78
19	75	53	72	63	86	73	86	78	86	81	89	78
20	72	54	75	64	84	73	88	78	87	81	89	79
21	68	54	66	64	85	74	91	79	85	81	89	79
22	68	55	58	63	88	74	88	79	88	82	89	79
23	64	55	60	63	86	75	85	79	92	82	87	79
24	74	56	59	62	89	75	80	79	94	82	92	80
25	80	56	64	62	88	76	85	78	94	82	85	80
26	70	57	68	61	83	76	86	78	90	82	85	80
27	68	57	74	61	79	77	73	79	88	82	81	81
28	75	58	82	62	79	77	74	78	81	82	86	81
29	72	58	82	62	73	77	75	78	85	83	88	82
30	63	59	78	62	72	76	83	78	90	83	90	83
31	58	59	......	....	77	76	......	....	88	83	92	83

	1884. September.		1884. October.		1884. November.		1884. December.		1885. January.		1885. February.	
Date.	A.	W.	A.	W.	A.	W.	A.	W.	A.	W.	A.	W.
1	85	83	87	76	69	66	53	57	72	49	52	47
2	84	84	88	77	76	66	53	57	38	49	42	47
3	86	83	84	78	70	66	52	56	37	48	58	47
4	88	83	86	79	74	65	60	55	40	48	57	47
5	86	82	89	80	61	64	62	55	55	47	56	47
6	86	82	92	81	53	63	74	54	71	47	44	47
7	89	82	87	80	53	62	65	55	54	47	67	47
8	86	82	76	79	59	62	64	55	55	48	56	48
9	86	82	80	79	66	61	65	56	65	48	62	48
10	83	81	78	79	68	61	65	56	58	49	46	48
11	79	81	76	79	70	61	65	56	66	49	27	48
12	74	80	83	78	71	61	72	56	67	50	44	48
13	78	80	82	78	74	61	55	56	58	50	36	47
14	72	79	77	77	66	61	53	56	55	50	37	46
15	77	79	66	76	70	61	70	56	70	50	37	45
16	81	79	75	76	69	60	51	55	74	51	48	45
17	83	78	75	75	65	60	62	55	48	50	48	45
18	84	78	76	75	71	59	52	54	36	50	52	44
19	79	77	75	74	69	59	24	50	35	49	36	43
20	86	77	75	74	53	58	29	49	38	49	34	42
21	83	76	76	73	58	58	48	49	41	48	33	42
22	82	76	81	73	69	59	64	49	34	48	41	43
23	82	75	69	72	69	58	53	49	34	48	36	42
24	82	75	54	71	55	58	42	49	61	48	48	42
25	83	74	66	70	53	58	45	49	56	48	45	43
26	84	74	67	70	62	58	32	48	43	49	43	43
27	82	75	75	69	64	58	38	48	52	49	50	44
28	88	75	82	69	66	58	48	48	55	48	60	44
29	88	76	74	68	59	58	64	48	40	47	....	....
30	89	76	66	68	60	58	69	48	62	47	....	....
31	....	......	57	66	....	....	74	48	53	46	....	....

	1885. March.		1885. April.		1885. May.		1885. June.		1885. July.		1885. August.	
Date.	A.	W.	A.	W.	A.	W.	A.	W.	A.	W.	A.	W.
1	63	45	76	53	78	67	81	77	77	80	90	......
2	49	45	72	54	70	67	88	78	79	80	84	......
3	57	46	69	54	70	68	88	78	83	80	89	......
4	67	47	60	55	76	68	85	78	86	80	86	......
5	55	47	57	55	79	69	88	78	82	81	90	......
6	57	47	76	56	69	69	77	77	90	81	91	......
7	60	48	76	57	83	70	85	77	91	82	92	......
8	47	48	74	57	80	70	87	77	92	82	88	......
9	43	48	62	58	78	71	77	77	93	82	87	......
10	63	49	49	59	67	70	68	76	92	82	87	......
11	58	49	60	59	72	70	76	76	91	82	92	......
12	52	50	63	60	74	70	82	75	85	82	91	......
13	43	50	63	60	69	70	83	75	85	82	92	......
14	46	50	54	60	69	70	88	76	86	82	88	......
15	66	50	68	61	75	70	87	76	89	82	79	......
16	52	51	81	61	78	71	87	77	89	82	82	......
17	...	...	62	61	66	70	84	77	87	83	88	......
18	34	51	58	61	73	70	78	78	90	83	86	......
19	52	51	68	61	81	70	81	78	85	83	91	......
20	44	51	72	61	83	71	83	79	76	83	91	......
21	48	51	75	62	87	71	86	79	91	83	90	......
22	38	50	81	62	85	72	89	79	92	83	90	......
23	36	50	83	63	84	72	88	79	96	83	84	......
24	43	50	83	63	85	73	81	79	90	83	86	......
25	60	49	83	64	89	74	82	79	89	83	90	......
26	64	50	84	64	88	74	89	79	92	84	81	......
27	62	50	76	65	86	75	87	79	91	84	75	......
28	67	50	76	65	83	75	88	80	91	84	79	......
29	43	51	76	66	82	76	90	81	91	84	84	......
30	56	51	77	66	82	76	77	81	91	85	73	......
31	71	52	...	...	86	77	...	...	90	85	71	......

1885. September.			1885. October.		1885. November.	
Date.	A.	W.	A.	W.	A.	W.
1	82	83	70	73	74	63
2	77	82	70	72	59	62
3	85	82	82	72	52	61
4	82	81	75	72	64	61
5	83	81	69	72	78	61
6	75	81	57	71	79	61
7	78	81	66	71	81	61
8	84	80	73	70	72	62
9	88	80	66	69	61	62
10	84	79	76	69	57	61
11	82	79	64	68	65	61
12	85	79	67	68	74	61
13	86	79	66	68	75	62
14	86	79	72	68	61	62
15	84	79	76	68	58	61
16	89	79	72	68	65	61
17	84	80	76	68	58	61
18	81	80	76	68	65	61
19	82	80	81	68	73	60
20	83	80	80	68	65	60
21	71	80	80	68	53	59
22	68	79	58	67	68	59
23	70	79	59	67	70	58
24	72	78	63	66	....	....
25	82	77	64	65	....	....
26	79	77	64	64	....	....
27	76	76	70	64	....	....
28	81	75	68	64	....	....
29	76	74	70	64	....	....
30	78	74	64	64	....	....
31	.....	.....	54	63	....	....

DESCRIPTION OF THE WATER.

This water is generally clear, and has a color from pale to deep amber, which color is not discharged by sedimentation. It is free from odor either when allowed free access to the air or after bottling or closing up in casks for years. The sediment is a finely divided mud, chiefly consisting of silica and alumina. It has the merest trace of lime or other mineral constituents.

The exception to this last statement is that during long protracted droughts the access of brackish water at Wilmington from the ocean—thirty miles away—is sufficient to allure crabs, shrimps and mullets into the water at this point. During such seasons, while there has been an amount of salt as high as fifty or sixty grains to the gallon, no saline taste was imparted.

THE COLORING MATTER IN THE WATER

is one of the marked peculiarities, and in some respects one of the gravest objections to its use for manufacturing purposes, and making it also unattractive for household purposes. The source of the coloring matter is the decomposing leaves, the roots of many trees, such as the pine and cypress, and such matters as are washed out from peaty soil. The latter alone, which is but a soil containing highly carbonized remains of leaves, roots, sphagnum, moss, etc., may impart this color to the water. It is not possible by ordinary filtration to discharge this color without the aid of chemicals, and, as before stated, sedimentation has no effect upon it.

The keeping properties of this water when confined for a long time in closed vessels is probably due to the very ingredient which gives it its color. This theory is consonant with practical experiences in the employment of vegetable substances, such as salicylic acid for the prevention and arrest of fermentation.

FILTRATION.

Filtration has been experimented with upon a large scale, the desideratum, of course, being to deliver a "white" water in the mains to consumers. As mentioned before, filtration and sedimentation, without the employment of chemicals, did not change the color of the water, and practically was not worth the expense involved. The basis of all the experiments was the property that commercial alum had in depriving the water of its color. The process consists in passing a volume of water through white sand, at the same time causing a solution of alum and a small portion of lime to filter through with the water. The water discharged when the proportion of the chemicals was correctly adjusted was white, odorless and tasteless. It was discovered that this filtered water, although not having any taste of alum, could be used upon an unfiltered bulk of water and still exert a degree of decoloration. One sample of this filtered water may serve to convey an idea. Chemical analysis gave the following:

	Grains per gallon.
Total solids	10.35
Consisting of chlorine	1.57
Volatile organic matter	1.45
Alumina (equivalent to 5.35 grains)	.65
Sulphuric acid (equivalent to 6.07 grains)	....

Another specimen of unfiltered water from the same source as above gave:

	Grains per gallon.
Total solids	11.18
Solids in supension	.10
Chlorine	2.50
Volatile organic matter	2.88
Alumina (equivalent to alum, .8234 grains)	.10
Sulphuric acid (equivalent to alum, 1.13 grains)	.47

Deducting the alumina and sulphuric acid equivalents of alum naturally existing from the above, it gives 9.46 grains per gallon, and, small as this is, it still possesses the property of coagulating and precipitating unfiltered water. The amount of alum so far used is too large, both in an economical point of view and chemically, to produce perfect results. It will probably be ascertained that the process of decoloration will be more economically and effectively accomplished in large settling basins, the chemical action going on more thoroughly in still water, after the alum is thoroughly mixed. The application of alum as above is not a new process, for it has been used as a domestic remedy for undrinkable water in Richmond and other cities where turbid river water is frequently delivered for consumption. None of the patented filters so far prove satisfactory on the large scale, although a few have succeeded in giving a very good result for domestic purposes. Numerous experiments are being pursued with good promise of success, and when that day comes Southern tide-water rivers will be far more valued for public supply.

AN ACCIDENTAL CHEMICAL EXPERIMENT ON A LARGE SCALE.

During this year an ice factory was erected at Wilmington. The question of water supply in proximity to transportation was the practical fact upon which the success of the venture depended. The factory was located on the Wilmington and Weldon Railroad, near the foot of a deep cut, down which a good stream of water flowed from a spring tapped in cutting the roadway through a sandhill. This water it was hoped would be adequate to the demand, but in the meantime river water, as delivered to consumers in Wilmington, was submitted to a chemist for his opinion as to its fitness for the purpose of ice-making, after distillation. The reply of the chemist was in the affirmative. The experiences of the manufacturer are intelligently written and are here submitted:

WILMINGTON, N. C., November 21, 1885.

Dr. T. F. Wood:

DEAR SIR:—We use what is known as the ammonia absorption process for making ice. We take ordinary aqua ammonia, 26° B., and distil off the ammonia gas at a pressure of 180 pounds. We pass this gas through 1700 feet of piping submerged in cool water; there the gas, under 180 pounds' pressure, liquifies. We then liberate the liquid gas into 3000 feet of iron pipe, submerged in strong salt-brine (90°), into which brine we set the cans containing the water to be frozen. The instant the liquid (anhydrous ammonia) is liberated it turns into gas, and as the gas expands it absorbs the heat from the salt water, that in turn taking the heat from the water in the cans, making ice. The gas discharges from the 3000 feet of pipe into what is known as an absorber, containing a quantity of pipe, through which water constantly flows. The heat that is taken up by the gas is there absorbed by the water and discharged with it, the gas becoming aqua ammonia again. The cans in which the ice is frozen are placed in the freezing-tank containing the salt brine, and filled with distilled water. The freezing begins around the outside of the cans and at the bottom and continues to the centre, the grain of the ice tending to the centre from all sides. It takes 48 hours to freeze one can solid, and we have 204 cans under process of freezing all the time. After being in twenty-four hours the ice is about five inches thick on all sides of the can. The top end is the last part to freeze. The blocks of ice weigh 225 pounds.

I first used the river water for making ice. Frozen in its natural state, the ice is dark and unsightly. I tried condensing a gallon, using an ordinary tea-kettle for boiler, and condensed the steam in a tin funnel about two feet long. The condensed water thus obtained was white, and to taste and analysis pure. We used the river water for about a week, when I noticed the condensed water had a green cast and a peculiar taste, which was attributed to the iron, as our boiler was new, of forty-horse power, and the steam being condensed passed through nearly 2000 feet of pipe. That was new. This taste intensified rather than diminished as we proceeded, and the water showed more color. All this time—about two weeks—we "blew" the boiler every four hours, about 500 gallons of water being discharged from the boiler each time. As an experiment, we ran twenty-four hours without blowing the boiler, by which time the condensed water had assumed a decidedly green cast, and made green ice, not as highly colored as grass, but decidedly green. We then shut down and blew all the water out of the boiler. This water was the color of lye, exceedingly soft to the hand, smarting severely when it came in contact with a cut or bruised place on the skin, and killed a number of eels in the small stream into which it discharged. We then filled the boiler with water taken from this stream and went to work again, when we made ice as clear as crystal, and the ice and condensed water were absolutely free from taste.

The temperature of this water increased as the summer advanced, and we saw clearly that cooler water was an absolute necessity, and we proceeded to dig a well. In order to expedite the work, we had to take up our suction pipe to rig a siphon, forcing us to use again the river water, and this time for six weeks. We soon observed the same taste and peculiarity of the condensed water, and in order to overcome the difficulty, if possible, blew the boiler every *two* hours. Still the same taste. Three weeks of steady work developed another change. The ice came out with a decidedly colored core in the centre, which core, when cut open, emitted a strong woody or creosote smell. This core gradually grew from an inch in diameter to four inches in diameter, and with the increase in size came a corresponding increase in taste and smell—so strong, indeed, as to lead a good many persons to believe the ice to be impregnated with creosote. I cut the core out of one block, and melted it in a clean bucket. The water so obtained was of a more decidedly greenish cast than the river water, with a very strong taste of wood or creosote. The odor was very similar to decayed cypress or juniper. We carry 100 to 110 pounds of steam on our boiler. This gives a temperature in the boiler of from 350° to 400° of heat, of course causing destructive distillation. I should not forget to mention that during the process of freezing first would appear an oily substance on top of the water, which gradually assumed a dark color; by the time six inches of ice had formed this substance would be in a mass about the centre of the water, and also line the inside of the ice from the bottom to the top, evidently being expelled from the water by the process of freezing. When the block of ice was nearly solid it would appear on top of the water in a small round patch about the size of an ordinary tea-cup. We finished our well after six weeks' use of the river water. From the well we obtain white water, and have ever since made translucent ice, absolutely free from taste—proving conclusively that the trouble was from the water and not from the machine, and that the destructive distillation made apparent impurities in the river water not developed by chemical analysis.

Yours truly,
WILLIAM E. WORTH.

This very expensive involuntary experiment brought to light qualities of the Cape Fear River water and its sediment which had never before been a matter of conjecture. The distillation of the first few days yielded a clear, good water, but as the sediment accumulated in the boiler, distillation at 350° to 400° F. sent over in vapor a tar product, which imparted to the ice a peculiar taste of creosote. This product collected from the water while in the freezing bath was brown, in globules, of a pungent odor, only slightly soluble in cold or boiling alcohol and in chloroform. In freezing it imparted to the ice a cloudy streak, radiating from the centre of the block. The taste of this part of the ice was very unpleasant, but it did not permeate the whole block, and the line of contamination could be easily traced, so that in sending it out to consumers this part was chipped out.

There are two explanations of the source of this tarry product. I think it was demonstrated by the manufacturer that the error did not take place in the process of making, as all contamination ceased as soon as other water was substituted for river water. Of the two sources of the tar product occurring in the condensed water it may be that the peaty sediment which accumulated in the boiler might have furnished it. It is more highly probable, though, that the mud of the river, long impregnated with tar and turpentine, precipitating and accumulating in the boiler, yielded under destructive distillation at 400° F. the product in question.

This paper has been presented to show some of the difficulties to be overcome in locating a source of public water supply in the south Atlantic seaboard. The waters of the lakes and ponds are quite similar to the rivers, and it is a very exceptional pond or lake or spring in this locality that would furnish a white water in sufficient quantity for public supply. Sewage contamination is not a difficulty of immediate, but rather of prospective importance, and, because of the sparseness of Southern population, more easily controlled.

The high temperature, though, which running streams attain—86° F. and higher, no doubt, if a sufficient number of observations were made—shows how large an element of decomposition is at work during the prolonged hot weather, suggesting the great importance of excluding decomposable matter from the source of water supply, and the additional precaution of securing water from the deepest streams or ponds.

The chief obstacle to a wise selection of a water supply is the money element, which at a very early period of the agitation of the question of water works enters into and controls the project. The question is very seldom a sanitary one, but one of profit to investors. Some of our Southern towns contemplating water works could well study the experience of other Southern towns that have already established a water supply. They will find that public opinion and sanitary advice have seldom influenced the course of a water works company, and just now more than one Southern city is perplexed with the difficulties brought upon them by false steps taken in the selection of their source of supply.

There is still another aspect of the question of Southern water supply which I will merely touch upon at present—the practicability of deep wells as a substitute for river water. Several Southern cities have succeeded in getting artesian water, but none so far of sufficient purity to be unobjectionable. As far as the experience in Wilmington goes, the water from deep wells is very. hard, with the exception of the one dug by Mr. Worth. This water is somewhat hard, but in the hottest days the temperature of it was at an average of 63° F., a feature of superiority over the river water, to say nothing of its freedom from organic impurities.

REPORT OF THE WAKE COUNTY BOARD OF HEALTH ON WATER SUPPLY FOR THE CITY OF RALEIGH.

To the Board of Health of Wake County:

GENTLEMEN:—The committee appointed by your honorable body to gather all facts bearing upon the present purity and possible future contamination of the waters of Walnut Creek, beg leave to submit the following report:

We have made a careful personal inspection of the stream, its tributaries and its water shed, from the head waters in Cary to the Rocky Hole, the latter being the place from which the city proposes to take its water supply. The dates of our visits are Tuesday, September 14th, Monday, September 27th, Monday, October 4th, Monday, October 18th, and Thursday, October 21st. The portion of creek examined is about eight miles long, quite crooked, with now and then long stretches of sluggish water, and is fed by several branches, among which may be mentioned Reedy Fork, Lynn's, Simmons', Bushy and Stony. The drainage area is partially wooded and partially cultivated, and according to Mr. Arthur Winslow, is about 18 square miles. We found that about one-fourth of the town of Cary drained into the creek, the excrement of about one hundred people being cast daily upon the water shed in close proximity to the stream, including the excrement of about 30 to 40 people which was daily dropped through a privy immediately into its head-waters, a small branch which has its origin in a spring in a tobacco factory and flows slowly through a portion of the town. We learned from a physician practicing in the village that during this summer several cases of typhoid fever had occurred on the watershed of the stream—one case being under treatment at the time of our visit. From Cary to Yates's pond there is, in our opinion, no obvious source of contamination. At Yates's mill, 4½ miles from the city, we found a pond of long standing and considerable size, its bottom and sloping banks covering a large area, and very objectionable, being full of decomposing vegetable matter and making a trap for catching and propagating disease germs brought down by storm-water. From Yates's pond to Rocky Hole we could discover nothing of special importance bearing upon the pollution of the water. The volume of the creek, according to Mr. Winslow's observations at the Rhamkatte Road July 28th, 1886, was 3,610,000 gallons per 24 hours, which is at present more than sufficient for the needs of our city. It is well enough, however, for prudential reasons, and as we are opposed to impounding reservoirs, to bear in mind the fact that as the section of country through which the stream and its tributaries flow becomes more densely populated, highly cultivated and deprived of its forest, the amount of flow diminishes and the danger of contamination increases. At present, however, with the exception of the objections, mentioned above, to Cary and Yates's mill, Walnut Creek, in our opinion, is subject to no more dangers of pollution from storm-water than creeks flowing through any inhabited and partly cultivated country.

At 4:09 o'clock, on Monday afternoon, Octobor 4th, 1886, we gathered specimens of water from the creek, at the Rocky Hole, in the Grimes farm, above the Asylum sewerage, and in about an hour or two afterwards, delivered them, in person, to Dr. C. W. Dabney, Jr. On October 9th, 1886, we received the following analysis from the North Carolina Agricultural Experiment Station, signed by Dr. Chas. W. Dabney, Jr., Director:

N. C. AGRICULTURAL EXPERIMENT STATION,
RALEIGH, Oct. 9th, 1886.

ANALYSIS No. 4151.

The sample of *drinking water* sent to the Station for analysis, in two glass bottles marked ——, water slightly clouded with clay and silica in suspension, contains: Total solids in solution and in suspension, 4.25 grs. per I. gallon. It was impossible to make quantitative determinations of the different "solids" in the small amount afforded by this sample. Qualitatively examined, the above showed the presence of

Silica, alumina and iron oxides (traces), probably in suspension; *lime*, potash and soda, sulphates and chlorides (traces) in solution; chlorine (1) 0.33, (2) 0.36 grs. per Imperial gallon; free ammonia (1) 0.0266, (2) 0.0266 parts per million; albuminoid ammonia (1) 0.120, (2) 0.110 parts per million.

NOTE.—The only thing about these results which would distinguish this water from the purest spring water, is the very small excess of albuminoid ammonia, unaccompanied by free ammonia in larger amount; and by more chlorine this albuminoid ammonia only points to slight *vegetable contamination.*

Your obedient servant,
CHAS. W. DABNEY, JR.,
Director.

After careful deliberation and much correspondence, we concluded to have our biological work done by Dr. Geo. M. Sternburg, Surgeon U. S. Army, and a most distinguished microscopist. His engagements, however, were such that he was unable, in person, to do the work for us, but highly recommended Dr. A. C. Abbott, Johns Hopkins University, Baltimore, Md., as a man thoroughly competent, having for sometime been his assistant. We therefore engaged Dr. Abbott's services, and in compliance with his directions, at about 4 o'clock on Thursday afternoon, October 21st, 1886, bottled and packed samples of water also taken from Rocky Hole. We sent them to Baltimore by the first express, which was next morning. On Friday night, October 29th, 1886, we received the following report from him:

BALTIMORE, October 28, 1886.

The sample of water sent me by you for biological analysis turns out to be of about the same degree of freedom from bacterial life as that of the city of Baltimore. That is, it is somewhat above the average purity. The plan of investigation that has been pursued is the gelatine plate method of Koch, by which one is enabled to say to a certainty the number of living organisms that may be present in a given volume of water.

In each of the bottles there were small particles of foreign matter held in suspension, which, upon microscopic examination, proved themselves to be nothing of any interest—dirt, vegetable fibre, &c.

The experiments for the detection of the presence of bacteria were conducted as follows:

From each bottle two series of three plates each were made, three of them being made with agar agar (Japanese gelatine) and kept at the body temperature, and three upon table gelatine (flesh peptone gelatine) and kept at the same temperature. Of those on the agar agar and kept at 36° C., the following number of colonies presented after 24 hours:

FROM BOTTLE NO. 1.

Plate made with 1 C. C. of water showed 61 colonies.
Plate made with 0.5 C. C. of water showed 33 colonies.
Plate made with 0.1 C. C. of water showed 5 colonies.

FROM BOTTLE NO. 2.

Plate made with 1 C. C. of water showed 59 colonies.
Plate made with 0.5 C. C. of water showed 35 colonies.
Plate made with 0.1 C. C. of water showed 8 colonies.

In a similar series of experiments made upon gelatine and kept at 21° C. we got the following results after 48 hours:

FROM BOTTLE NO. 1.

Plate made with 1 C. C. of water showed 83 colonies.
Plate made with 0.5 C. C. of water showed 55 colonies.
Plate made with 0.1 C. C. of water showed 30 colonies.

FROM BOTTLE NO. 2.

Plate made with 1 C. C. of water showed 118 colonies.
Plate made with 0.5 C. C. of water showed 79 colonies.
Plate made with 0.1 C. C. of water showed 17 colonies.

Of these numbers 26 colonies of those on the 1 C. C. plate from Bottle No. 1 and 27 colonies on the corresponding plate from Bottle No. 2 caused liquefaction of the gelatine. Of the whole of those present there appeared none that could be considered suspicious, as the whole number comprised, with a very few exceptions, those organisms that make water their common habitat and which possess no known pathogenic properties.

These figures indicate, therefore, the degree of purity of the samples of your water from a bacteriological standpoint.

The number of colonies indicate the number of single organisms that were present at the time the experiment was made, and these colonies are the outgrowth each of a single organism. Water samples differ very widely in the number of contained organisms, some revealing the presence of only one or two per cubic centimetre, while others will be so rich in them as to require a high degree of dilution before it becomes possible to count them at all.

So that from this you will see that the samples of water, as they came into my hands, represent a more than average degree of purity.

I enclose a scheme of the above results made in a condensed form with an average of two bottles.

Very respectfully, yours,
A. C. ABBOTT, M. D.,
Johns Hopkins University, Baltimore.

CONDENSED SCHEME. Water from Walnut Creek.	Amount employed.	Number of colonies on agar agar after 24 hours at 36° C.	Number of colonies on gelatine after 48 hours at 21° C.	Colonies that liquefy the gelatine.	Average number of colonies in the amounts taken.
Bottle No. 1.	1 C. C.	61	83	26	72
	0.5 C. C.	33	55		44
	0.1 C. C.	5	30		17.5
Bottle No. 2.	1 C. C.	59	118	27	88.5
	0.5 C. C.	35	79		57
	0.1 C. C.	8	17		12.5
Average of both bottles	1 C. C.				80
	0.5 C. C.				50.5
	0.1 C. C.				15

To what result, then, does all this lead us, both scientifically and practically? We would state that in our judgment it would be impossible to express a positive scientific opinion upon the purity of any water, unless the investigations extended over a period of at least a year, including chemical and microscopical analyses of several specimens of the proposed water, taken at different times and from different portions of the stream and its tributaries. Neither the time nor the means being allowed us for such investigations, it is manifestly unscientific to express an unconditional opinion for or against the purity of Walnut Creek water, such opinion being based solely upon a single chemical and biological examination, unless, however, such analysis should show very gross pollution. By reference to the above chemical analysis, it will be observed that there is mention of some slight vegetable contamination. The process employed in the chemical analysis being that of Wanklyn, according to his classification such contamination would class it amongst the suspicious waters. By reference, however, to the reports of the National Board of Health, it will also be observed that although waters contain much larger amounts of albuminoid ammonia, and even free ammonia and chlorine, than the water we have under consideration, yet they are classed as good and organically safe from a chemical standpoint by most competent observers who have used Wanklyn's method. The rigid standard of classification of Wanklyn, therefore, is not unreservedly accepted, but is subjected to considerable variations. The chemical analysis, then, showing the amount of solids, free ammonia and chlorine to be small, according to the standard of all observers, and the quantity of albuminoid ammonia to be within the limits of safety recognized by most chemists, and the biological analysis showing it to be above the average degree of purity, containing not even any suspicious particles in suspension, nor any suspicious organisms, we think that—keeping in view all the while the basis above given for our opinion—the city could accept Walnut Creek water as a safe water,

Provided, 1st. There are no impounding reservoirs upon the stream or upon any of its tributaries, so that the water supply may be taken from the daily flow of the stream.

Provided, 2d. That such an arrangement be made as to prevent as far as possible the pumping into the mains of storm water, even if filtered.

Provided, 3d. That the water be so thoroughly filtered as to remove any excess of albuminoid ammonia, and if any chemical method be employed that not more than one grain to the gallon of the substance used be permitted to pass into the filtered water.

Provided, 4th. That none but filtered water taken from above the Asylum sewer be allowed under any circumstances to be pumped into the mains.

Provided, 5th. That the sources of pollution in the village of Cary and the dam at Yates's mill be removed.

Provided, 6th. That there should be a constant service under high pressure.

In conclusion, we advise that legislation be obtained from the next General Assembly empowering the city authorities to police the water-shed.

Respectfully submitted,
JAMES McKEE, M. D., CHAIRMAN,
RICHARD H. LEWIS, M. D.,
W. I. ROYSTER, M. D.,
HUBERT HAYWOOD, M. D., SECRETARY,
Special Committee Wake County Board of Health.

Received, unanimously adopted and ordered to be transmitted by the County Board of Health, through this special committee, to the Water Works Committee of the Board of Aldermen.

This was done November 2d, 1886.

APPENDIX.

THE CARE OF

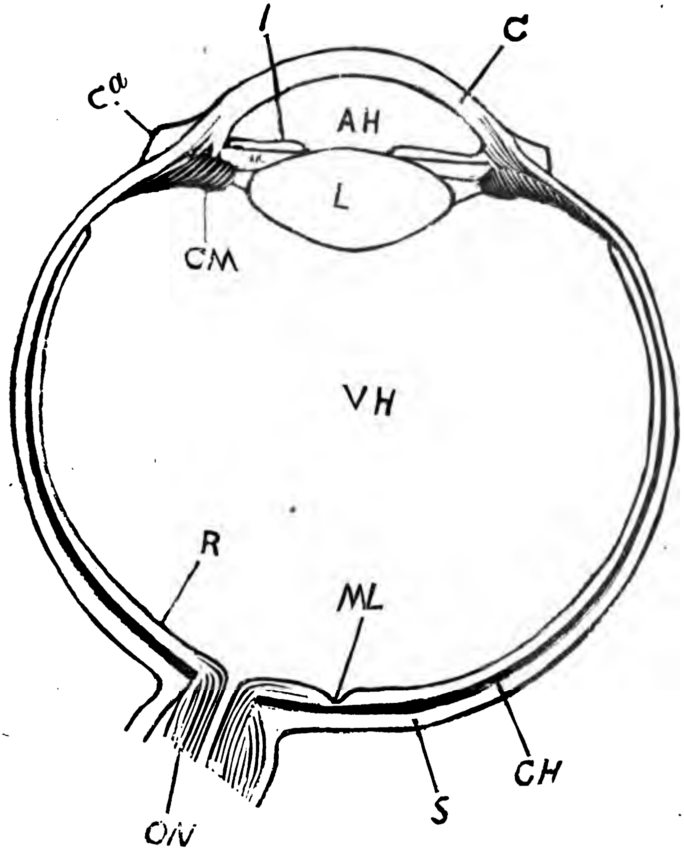
THE EYES AND EARS.

BY

RICHARD H. LEWIS, M. D.,

MEMBER OF THE STATE BOARD OF HEALTH, AND SURGEON FOR DISEASES
OF THE EYE, EAR AND THROAT TO ST. JOHN'S HOSPITAL, AND TO
THAT OF THE LEONARD MEDICAL SCHOOL, RALEIGH, N. C.

DIAGRAM OF THE EYE IN HORIZONTAL SECTION.



S, sclerotic coat; **CH**, choroid coat; **R**, retina, or nervous coat, continuous with **ON**, the optic nerve; **ML**, Macula lutea, or yellow spot, the centre of retina; **VH**, vitreous humor; **L**, lens; **AH**, acqueous humor; **I**, iris; **CM**, ciliary muscle; **C**, cornea; **Ca**, conjunctiva.

PREFACE.

THE object of this article, prepared at the request of the State Board of Health, is to assist, as far as may be, in preserving in a condition of health and usefulness the most important of the senses.

Eyesight stands easily first in the estimation of all, and Hearing is only second to it. Blindness being one of the most frequent causes of pauperism, it becomes still more the duty of the guardians of the public health to present to the people such information as may help to prevent its occurrence than a regard simply for the happiness and prosperity of the individual would require. But there are so many instances of damage to, and loss of, one or the other of these precious senses when they might have been saved by the knowledge of a few simple facts, that there is no need to mention the relief of the community of a pecuniary burden to show the necessity for such a publication.

This, then, being intended for those not at all versed in medicine, must be as free as possible from the technicalities in which the professional man is accustomed to think, and at the same time as brief as possible in order to come, together with other necessary publications, within the resources of the Board for printing. The difficulties of the task are greatly increased by these conditions, but it shall be my endeavor to be as plain and simple as possible, and at the same time as concise as a regard for clearness will permit. I trust the kind reader will bear these facts in mind.

217 N. WILMINGTON ST.,
Raleigh, N. C., May 12, 1886.

THE CARE OF THE EYES.

In order to understand and appreciate instructions as to the proper method of caring for any organ, it is absolutely necessary to have some idea of the nature of that organ. We must therefore, before going farther, study for a few minutes the structure of the eye. Reference to the diagram in front will assist greatly in understanding what follows.

The eye is a nearly round ball about seven-eighths of an inch in diameter. The walls of the posterior five-sixths of this globe are made up of three thin coats, lying one immediately upon the other like the layers of an onion. The interior of this part is filled with a rather thick, viscid, but perfectly transparent fluid called the vitreous humor. The outermost of these three coats or layers is a dense opaque membrane named the *sclerotic*, fibrous in structure, something like the tendons or "leaders," and therefore very strong and tough. Its purpose is to preserve the shape of the ball and to protect the more delicate structures within. This constitutes "the white of the eye." Next to that is the middle coat, or *choroid*, which is composed of a network of blood-vessels, in the meshes of which is deposited a kind of dark pigment or coloring-matter, the object of which is to prevent dazzling from bright light. The eyes of albinos are very sensitive to light, owing to the absence of this coloring-matter in this coat as well as in the hair. At its front border this coat is thickened by the addition of another element, the ciliary muscle, or muscle of accommodation—a structure of great interest and importance to us. Interior to this is the third and innermost layer, called the *retina*. It may for our purposes be considered an expansion of the optic nerve, which, coming from the brain, perforates the first two coats and then spreads out into this nervous layer, "like the cup of a tulip on its stem." This is the sensitive plate on which the pictures of all objects seen are taken.

The front of the eyeball is quite different from that portion we have been considering. The first thing we notice is a perfectly transparent structure (the remaining one-sixth of the whole ball), which appears to be part of a smaller globe, and which seems to be set in the white of the eye like a watch-crystal in its rim. This is the *cornea*. Just back of that we observe a very beautiful curtain, which, on account of its infinite variety of colors in different individuals, is called the *iris*—that word meaning a rainbow. Near the centre of this curtain is a round black spot, which is often referred to in common language as "the sight of the eye." This is merely a window or opening in the curtain, the *pupil*, through which light enters the eye, and out of which we see. This window partially opens and shuts automatically in order to regulate the amount of light. The space between the iris and the transparent cornea is filled with a watery fluid, the *aqueous humor*. Immediately behind the iris, suspended in a little sac, is the *crystalline lens*. It is convex or bulging, both in front and behind, and its function is to make pictures on the retina of all objects before the eye.

Covering all of the white of the eye that can be seen, and leaping from that over to the lids and lining their under surfaces, becoming continuous with the skin at their edges, is an exceedingly thin, transparent mucous membrane called the *conjunctiva*. It is this membrane which is involved in ordinary simple inflammations of the eye. It is lubricated by tears manufactured for the purpose by the lachrymal gland at the upper and outer corner, the surplus being carried off by two little gutters in the inner ends of the two lids which open into a larger drain emptying into the nose. Each eye is moved in different directions by six little muscles, but the only ones of special interest to us are the two inner straight muscles, that are attached one to the outside of each eye next the nose, which converge the two eyes upon near objects.

For the sake of clearness we will make two general divisions of our subject, and consider the eye first in its relation to weak sight; and secondly in its relation to blindness, although they will overlap one another at certain points.

WEAK SIGHT.

Weak sight is that condition of affairs in which, while there is no evidence of disease, the eyes are nevertheless unequal to the performance of their legitimate work. The acuteness of sight for ordinary distant objects is sometimes below the standard and sometimes not, but, whether it be or not, any continuous effort at *near* work, as reading, writing, sewing, etc., is impossible, and always brings on a certain characteristic group of symptoms. First, a heavy, tired feeling in and around the eyes is observed, and then the letters or stitches become indistinct. After a rest of a minute or two, they can be again seen plainly, only to become blurred even more and in a shorter time than before. A repetition of these attempts causes pain and watering of the eyes, with redness of the balls and edges of the lids, often headache, and, in some cases, a disturbance of the general health, more especially the nervous functions. If attended to promptly, it can nearly always be easily relieved; but if it be neglected and nothing done for it, perseverance in near work is liable to cause such sensitiveness and irritability of the eyes as to render them not only practically useless, but a constant source of annoyance and discomfort in the ordinary lights we must daily encounter. It is exceedingly common (and through heredity becoming more so every day), and, while not productive of blindness, interferes seriously with the practical use of the eyes, as we have just said. It is, moreover, very often met with in the young during school-life, when it prevents their studying with ease and comfort, if they can at all, and by so doing obstructs the formation of the *habit* of study, which in the average boy demands every encouragement, thereby affecting injuriously the character, probably for life. Such being the case, and the remedy for these troubles being very simple and easily applied when once they are recognized and their true nature appreciated, the Board of Health regards it as of prime importance that the public should be put in a position to recognize and appreciate them.

Advice to intelligent people is much more apt to be taken, if accompanied by the reasons for it, and they are, besides, much more likely to be interested in a subject if it can be explained and made clear, than they would be in a mere didactic statement of bald, unillustrated facts. Therefore, as interest in these important matters, on the part of the people, is what the Board is especially anxious to create, I shall endeavor to elucidate the subject in as simple a manner as possible.

Weak sight—asthenopia, as it is technically called—is sometimes due to a weak and irritable condition of the nervous apparatus of the eye, pure and simple; and this form occurs most frequently in young women, who are peculiarly prone to functional nervous disturbances. But in a vast majority of instances, it is caused by an *overstrain of the muscles* of the eye, either those which adjust each eye for objects at different distances, or those which turn both eyes in upon near objects. This overstrain may be, and sometimes is, due to simple weakness of these muscles, as often occurs during convalescence from severe attacks of illness, in which cases it is only temporary; but it is nearly always a consequence of the faulty shape of the ball, causing certain optical defects or errors in refraction, as they are usually called.

In order to understand these optical defects, it is necessary to first understand what is a correct eye, and how we see with it. The knowledge of a few facts in regard to the nature of a convex lens will render this easy.

A convex lens is a body of some transparent material, usually glass as we see it, flattened from side to side, thicker in the middle than at the edges, with its faces having the curvature of part of a sphere or round ball. A familiar example is an ordinary magnifying or sunglass. Its peculiar property is that rays of light emanating from any object, after passing through it, are brought together again in the same relation to one another as they started from the object, and a picture or image of it is thereby produced. The point at which this union is effected, is called the *focus* of the lens. The *more convex* the lens, the stronger it is and the *shorter* is its focus. The action of a convex lens can be interestingly illustrated in this way: Having closed all the doors and windows of the room except one, in order to shut off the side lights, take a magnifying-glass—or, if not convenient, the spectacles of the oldest person in the house, they being convex lenses—and holding it immediately opposite the window, about three feet from the wall, gradually approach it thereto, and you will presently see come out on the wall a distinct picture, turned upside down, of the sky, trees and other objects outside.

If you will turn to the diagram of the eye, you will recall that the lens is situated immediately behind the iris and opposite the pupil, and that the sensitive retina is the coat nearest to it, being the innermost of the three. Now, as the convex lens of glass held opposite the window of the darkened room makes a picture of outside objects on the wall, just so does the convex lens in the dark chamber of the eye placed opposite the only window, the pupil, make a picture of outside objects on the retina, which in the normal eye is exactly at its focus. The impression thus made upon the retina is transmitted to the brain by the optic nerve, and the act of vision is complete.

In what has been said about rays of light, reference has been had only to rays from *distant* objects, which are always practically parallel to one another. It is an optical fact that rays emanating from objects nearer than twenty feet sensibly diverge from one another, and that the nearer the object the more divergent they are. A lens having only so much power to concentrate light, it is evident that divergent rays cannot be brought to a focus as soon as parallel; in other words, that their focus must be farther from the lens. This being true, how is it that we see near objects distinctly, as the retina cannot be set back to this new focus? By an increase in the thickness or convexity of the lens, which, as you remember, *shortens* the focus. This is what is called the accommodation of the eye, and it is effected in the following manner: The inherent tendency of the lens-substance, which is exceedingly elastic, is to assume a more globular form, but, enclosed in a sac, it is suspended or swung in the larger concentric circle made by the ciliary muscle by means of a connecting band (see diagram), and as long as the muscle is at rest the sac is kept upon the stretch and the lens more or less flattened. As soon, however, as the muscle contracts, being a ring, it must become smaller, and in so doing necessarily slacks the sac, thereby allowing the lens to follow its natural bent and bulge more in the middle. This is clearly shown in Fig. 1, where one-half represents the position of the parts when the eye is at rest or adjusted for distance, and the other half when the muscle has contracted and it is adjusted for near objects. It will be observed that the edge of the lens is nearer to the muscle in the latter, and that therefore the suspensory ligament or band must be slacked.

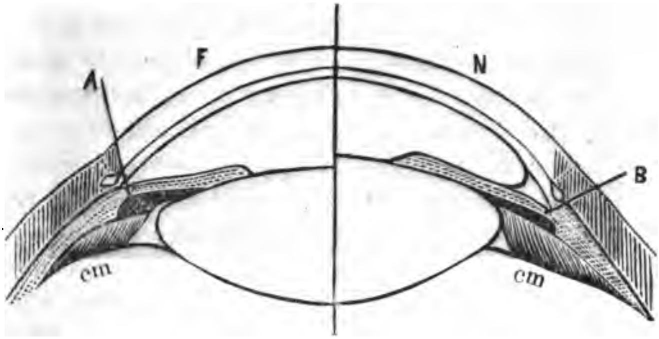


FIG. 1.

In this way each separate eye is accommodated for different distances, but, as we always use the two eyes together, the adjustment is not complete unless they are both fixed upon the object. This convergence is made by the inner straight muscles attached to the sides of the balls next the nose, and the nearer the object of course the more must the eyes be turned in.

Thus we see that the adjustment of the eyes for near objects is accomplished by a *muscular effort* on the part of two sets of muscles, and that the *nearer* the object the *greater* the effort required of both, so that there is always a harmony of action between the two. If you will look steadily at a pencil or your finger held less than six inches from the eyes, you will be distinctly conscious of this effort, which if kept up becomes painful;

but at the ordinary distance of ten or twelve inches it is not perceptible in eyes of the proper shape. But variations from this proper shape are exceedingly frequent, and, as said before, defects in form are nearly always at the bottom of weak sight. They are of three kinds. In Fig. 2 the line **X Y** represents the retina in a normal eye at the proper distance from the lens, but the eye may be too short, with the retina too close to the lens, **A B**, causing *over-sight* or *far-sight;* or it may be too long, with the retina too far from the lens, **M N**, causing *near-sight* or *myopia;* or the clear front, the cornea, may be irregular in its curvature, producing what, for want of a common name, will have to be called by the technical term of *astigmatism.* An easy way to remember these errors is to bear in mind that the short eye has long sight, and the long eye short sight, while the astigmatic eye does not have good sight at any distance.

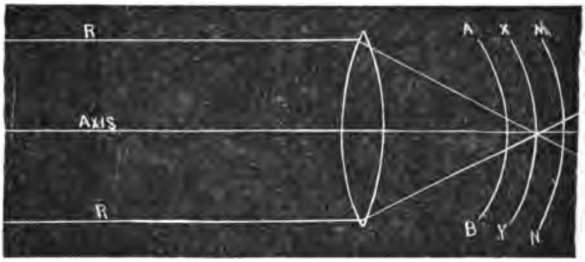


FIG. 2.

Over-sight or *Far-sight* is by long odds the most common of these optical defects, certainly in this country, and it is therefore the most frequent cause of weak sight. But how does it cause weak sight? you will ask. By adding to the strain upon the accommodation. In the normal eye, the retina being exactly at the focus of parallel rays (**X Y**, Fig. 2), no effort whatever is required for distant vision, and the accommodation for near objects can be made without trouble; but in the short eye (**A B**) the focus must be shortened even for distance, and consequently just that much work must be added to what is usually required of the little muscle; and that is too much for it, so it breaks down, and we have precisely what we would expect from muscular fatigue—viz., the sense of weariness and heaviness about the eyes, the recurring dimness of the letters, the aching, and other symptoms characteristic of weak sight. Therefore, upon the occurrence of these symptoms we would suspect the presence of over-sight, especially if distant vision were perfect (which would exclude near-sight and astigmatism), although it is not perfect in the highest degrees of over-sight itself, because in them the ball is so very short that it is beyond the power of the muscle to bring up the focus of even parallel rays to the retina. Such cases, however, are comparatively rare. Another effect of this over-sight is that the harmony of action between the two sets of muscles used in adjusting the eyes, accommodation and convergence, is destroyed, and as a result we frequently have crossed eyes, this being the cause in over 75 per cent. of such cases.

The remedy is simple and—if applied early before the eyes become chronically irritable—sure. Everything necessary to be done is to shorten the focus of the lens in proportion to the shortness of the eye, so as to do away with all extra effort—that is, all effort for distance—and put the eye on an equality with the normal eye. This is easily done by adding on another convex lens of the proper strength in the shape of spectacles.

Near-sight or *Myopia* is a subject of peculiar interest to the custodians of the public health. It is just the opposite, optically, of far-sight or over-sight, and, while the conditions causing the latter are always congenital, in near-sight they originate, as a large number of investigations show conclusively, between the ages of six and sixteen, or during school-life—rarely before and rarely after that period.* Heredity exerts a powerful influence in its production, a considerable proportion of the children of one near-sighted parent being apt to develop it, but it is very often acquired when there is no predisposition to it. When once established it is incurable. *It can to a large extent be prevented by proper care* on the part of parents and teachers during the period named. I shall therefore, as the representative of the Board of Health in this matter, endeavor to set forth clearly the true character of the affection, with the means of its prevention, in order to save our people as far as possible from becoming any more "bespectacled" than is absolutely necessary.

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* It appears from the German statistics that the percentage of myopia, beginning with less than one half of 1 per cent. during the first half year of school-life, increased gradually from year to year to over 60 per cent. on an average in the highest class, in one instance going as high as 79 per cent. The Germans, however, are a peculiarly near-sighted race, and in this country the percentage of short-sight is only about half as great. An interesting result of the American observations is the fact that myopia is very rare among the negroes; all of which demonstrates in a general way the influence of literary culture and of heredity in the causation of this trouble. The investigations further show that the devel-

As mentioned above, near-sight is due to an elongation of the eye-ball displacing the retina backward, so that parallel rays come to a focus in front of it, and only divergent rays—from near objects—come to a focus exactly on it, and they only, therefore, can be distinctly seen; so that the causes of short-sight are to be found in everything that has a tendency to increase the length of the ball.

Merely mentioning the fact that anything injurious to the general health, by weakening the resisting power of the tissues of the eye in common with those of the rest of the body, assists in producing this elongation, and calling attention especially to the execrable ventilation of many school-rooms as a most active agency in this category, I will point you particularly to those causes acting directly through the eye itself.

It is now regarded as an established fact that the continued tension of the muscles of adjustment (accommodation and convergence) is the principal factor in the production of near-sight; and, it having been explained above that the nearer the object to the eyes the greater the tension or strain upon both these sets of muscles, it follows that everything having a tendency to cause the undue approximation of objects on which the eyes are continuously used during childhood assists in the origination of this condition. I say "in childhood," because, as we have seen, it nearly always begins during that period; and it does so for the

opment of near-sightedness is in a direct ratio to the prevalence of the unfavorable conditions referred to in the text, and that it increases in degree, after it has once started, from year to year.

reason that the tissues of all growing and immature animals are more soft and yielding than when they have attained the firmness of maturity—another reason for special attention to their general health at this time.

Since a large part of childhood, and particularly that part of it in which the eyes are used most on near objects, is passed in the school-room, it is there that we would naturally seek the causes of this trouble. And it is there that they are generally found. School-children are often compelled to hold their books too near—that is, nearer than ten inches—because the amount of light is insufficient. This question of plenty of light of good quality (the best is direct from a northern sky) in the school-room is of the highest importance, and cannot be impressed too deeply upon those having such matters in charge. In a general way, it may be said that there should always be enough light to enable a child to read on a moderately clear day fine print in the darkest corner of the room at the distance of a foot. And the direction from which it comes is also important. Preferably it should come from the left and above, so that, while illuminating the page, it may not fall upon the eye, nor cast a shadow of the hand in writing. The next best direction is from behind, then from the right, but never from in front. The children should always look at a dead wall. I append an admirable statement of the "Requirements of the Model School-room,"* copied in the *Sanitarian* for October, 1885, from *City School Systems of the United States*, and earnestly commend it to all school boards and others having in charge the building of school-houses. It need not be more expensive than the ordinary plan, except in the matter of windows; and I am sure no one will grudge the children under his care in this respect the very slight additional cost necessary to supply them with light enough for the comfortable and *safe* use of their eyes.

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* "REQUIREMENTS OF THE MODEL SCHOOL-ROOM.

"(1) *Shape.*—It should be oblong, the width being to the length about as three to four, with the teacher's platform at one end.

"(2) *Size.*—For primary or grammar school, with register of 54 pupils and attendance of about 50, the room should be about 33 feet long, 25 wide, and 13 high, which gives practically upward of 200 cubic feet of air and 16½ square feet of floor-space to each pupil.

"(3) *Lighting.*—Four windows on the left of the pupils as they sit, the tops being square and not more than six inches from the ceiling, the bottoms being at least three and a half feet from the floor, equally spaced, not grouped, with transom sashes hung at the base above the sliding sashes. A window or two in addition at the back is admissible. The size of the windows on the side, taken collectively, should equal at least one-sixth of the floor-space. The highest authorities in school hygiene require 300 or 350 square inches of glass for each pupil.

The light being sufficient, the print may be bad or too small, though this danger has now been largely eliminated by the spread of knowledge on this subject and the active competition of publishers.

Sometimes the proportion between the height of the seat and that of the desk is such as to bring the book too near, as a low seat with a high desk.

Occasionally the seat has no back, so that from sheer fatigue the child is constrained to lean forward on the desk to rest himself.

Any of these things may cause this dangerous approximation, and not infrequently it is made more hurtful by a system of instruction which requires it to be kept up continuously for hours at a time.

"(4) On the side opposite the windows two doors, with transom windows above hung at the base, and between these transom windows, and on the same line, two more windows of the same kind and hung in the same manner.

"(5) The wall should be slightly tinted, but not the ceiling.

"(6) A black-board may be between the doors, but a sliding black-board back of the teacher's platform, or a portable one on the platform, in accordance with the German idea, would perhaps be better than the profusion of wall black-board now in vogue among us.

"(7) *Location of Seats.*—The main rule to be observed in the placing of the seats is to carry them as far as possible toward the window side of the room, and as far as possible from the opposite side; the aim being to make the arrangement such that the distance of the outer row of desks from the windows shall not exceed once and a half the height of the top window from the floor."

Proper height of seats and desks for different ages, as approved by the Boards of Health of New York and Chicago:

From	**7 to 9**	**years,**	**top of**	**desk**	**23**	**inches,**	**front of**	**seat**	**12¼**	**inches.**
“	**9 to 11**	**“**	**“**	**“**	**24**	**“**	**“**	**“**	**12¾**	**“**
“	**12 to 14**	**“**	**“**	**“**	**25¾**	**“**	**“**	**“**	**14**	**“**
“	**15 to 18**	**“**	**“**	**“**	**27½**	**“**	**“**	**“**	**15¼**	**“**

The approximation of the book to too near a point is dangerous, because, as we have seen, it necessitates a strain upon the muscles of adjustment. That strain excites an increased flow of blood to the eyes to furnish the power for the extra work. The increased amount of blood causes dilatation of the blood-vessels and congestion, which conduces to the softening and degeneration of the coats, especially of the outer, tough, white coat, whose peculiar function is to preserve the shape of the ball. At the same time it has a tendency to augment the volume of the humors within the eye. This increase in the humors adds to the pressure from within outward, causing the softened coats to give way or bulge slightly at their weakest point, which is at the back, around the entrance of the optic nerve. But the principal factor, probably, in the production of the bulging is the squeezing of the ball by the muscles which move it, as they are put greatly upon the stretch when the eyes are turned in much. The walls, having once begun to give way, become thinner and less able to resist, and, the same causes continuing to act, the near-sight is apt to increase. If the bulging extend beyond a certain point, the two inner and more delicate coats become very much damaged, and sometimes destroyed, by the excessive stretching. Occasionally the retina, unable to follow farther, is detached from the coat lying under it, and then total destruction of sight is only a matter of time. So that short-sight is nearly always accompanied by a *diseased condition*, often progressive in character, that may, and not infrequently does, end in blindness, making our duty to give warning of its dangers the more imperative.

It is the duty of the teacher to see to it that the faulty conditions as to light, etc., above indicated, are corrected, so far as lies in his power. He should, besides, make it a point to frequently interrupt the studies by various appropriate exercises (now common in well-managed schools) which will permit a rest of the eyes, and by frequent recesses. Parents also should exercise supervision in these matters at home, and in addition to carrying out the instructions given under the head of "General Directions," they should forbid too much study and reading, especially if their children be precocious and disposed to be bookish, and encourage them to outdoor life. This is often the more urgent because such children are apt to be feeble and delicate in constitution.

Owing to the presence of disease in so many near-sighted eyes, they are very often sensitive, irritable and painful. The ordinary symptoms of weak sight, too, are frequently complained of, even when the morbid changes are not very marked, they being due to the overstrain of the muscles of convergence, caused by the necessity of holding the book too near in order to make out the letters.

Attention to the presence of this defect will most likely be called by the child's inability to read figures on the black-board, or in some similar way. Either a *high* degree of over-sight or the irregular error, astigmatism, may cause this as well as short-sight, but the difference between them and the true myopia is that in the last the sight for objects held near enough is generally unusually acute, while in the first two it is apt to be more or less proportionally bad at all distances.

When once the fact becomes known, the eyes should be scrupulously guarded, and upon any complaint (or without waiting for it if the child seems to be very near-sighted) the advice of a competent physician should be promptly sought, so that he may give fully and explicitly the proper directions for the treatment and care of the eyes, including, if the state of the case warrant them, the proper concave glasses. Concave glasses, being the reverse of convex, lengthen the focus to suit the (short-sighted) long eye. It is of peculiar importance that accurately-adjusted glasses should be worn in these cases, because they not only permit the removal of the book to a safe distance, thereby assisting greatly in checking the progress of the affection, but they also enable the child to imbibe unconsciously a vast amount of knowledge that would otherwise escape him. At the same time, being in a position to see and enjoy the world around him, he would be encouraged to use them on distant objects and get away from his books.

Astigmatism.—The explanation of this error is apt to be so confusing to any one not quite familiar with optics that I shall not weary you, but will merely mention certain characteristic facts. The astigmatic person sees neither distant nor near objects distinctly, but he has the peculiarity of seeing lines running in one direction more clearly than others at right angles to them, and these lines are usually vertical and horizontal. He is apt to complain of all the symptoms of weak sight, probably in an exaggerated form, with an unusual amount of headache, and sometimes other nervous symptoms. Glasses accurately calculated, and made (as they must be) for the particular individual, render the sight acute, and are often of unspeakable comfort.

Old Sight cannot be considered, strictly speaking, as an optical defect, but it is merely one of the changes which come to us all with age. The lens of the eye becomes stiff and hard, less elastic than in our younger days, and consequently when the muscle of accommodation, which has also lost some of its vigor, slacks the sac holding it, it does not assume the convexity necessary for distinct vision of near objects. At the same time, distant vision remains as good as ever, because, as you remember, no adjustment is needed in the normal eye for distance. It usually makes its appearance between forty and fifty years of age. The first symptom is a disposition to hold the book or paper rather farther off or to seek a better light, especially at night. After a little the symptoms of weak sight come on, and for the same reason that they usually appear, viz., overstrain of the muscle, though this time it is not due to the shape of the ball, but the consistence of the lens. The remedy is found in convex glasses, which by shortening the focus assist the accommodation and relieve the strain. It is very important to put on glasses as soon as needed, to avoid this strain, not only as a matter of comfort, but because the overstraining of old eyes is thought to be one of the causes of a most serious and fatal disease of the eye.

RECAPITULATION.

In the preceding pages an attempt has been made to set forth, as simply and clearly as possible, certain facts of general interest and importance in regard to the eye, especially those bearing upon the exceedingly common and troublesome group of symptoms included under the general term, "weak sight," and upon the nature and dangers of near-sight. The subject has been dwelt upon—to the point of tediousness, some will feel, I fear—because, while of very frequent occurrence, and when present very annoying, even to the extent of rendering the eyes practically useless, the nature of weak sight is not at all understood by most people, nor are they aware that it can in most cases be completely relieved by a very simple remedy. Neither is it generally known that near-sight, often the result of preventable causes, is frequently associated with disease that may prove fatal to vision, and that special care is therefore required in its management. On the contrary, the popular opinion is that near-sighted eyes are strong eyes.

It has been shown that in the normal eye objects are seen by the formation of images or pictures of them through the instrumentality of the lens on the sensitive retina; that distant objects are seen clearly without effort, while near objects are made distinct, by a muscular effort, it is true—the accommodation—but one that can be made and kept up without fatigue; and that the two eyes are held upon near objects comfortably by the muscles of convergence. It has also been explained how certain departures from the normal in the shape of the eyeball will bring about an overstrain of one or both of these sets of muscles, causing weak sight. Attention was called to the short eye, causing over-sight or long-sight, as by odds the most frequent cause of weak sight, though certain nervous conditions, weakness of the muscles from sickness, and strain of the muscles of convergence in short-sight, were mentioned as being sometimes responsible for it. It has been further made plain that near-sight, or myopia, is the result of an elongation backward of the globe; that it nearly always originates during school-life or between the ages of six and sixteen; that it is often progressive in character, and is then associated with diseased conditions which may lead to total loss of sight; that its cause is too great tension or strain of the muscles of adjustment, resulting from too much study or from unfavorable surroundings, necessitating an overstrain by requiring too near an approximation of the object; and, finally, that it is largely preventable by proper care.

GENERAL DIRECTIONS.

The directions for the proper use of the eyes follow, almost as a matter of course, from what has been said.

Always have plenty of light. Economy in light is very poor economy. Many of the most intractable forms of weak sight I have seen have resulted from the use of the eyes by a bad and insufficient light. Any good, white, steady light will answer, provided it is *bright* enough. The German student's lamp, looked at from every point of view, expense included, is probably the best light, but any good lamp, with a large wick, that is kept clean and well-trimmed and filled with good oil, will do very well. Avoid flickering gas-jets. If you prefer gas, see that the flame is steadied by an argand burner or a transparent globe with a large opening below. The light should come from behind and the left, so as to illuminate the page and not the eyes. Nothing is more irritating than a number of lights falling upon the eyes from different directions, as the jets in a church or public hall, and those with sensitive eyes should never attend such places at night without the protection either of dark glasses or a shade.

Never read by twilight. I have in mind now, a young lady of prominence, who, for one imprudence in this respect, forfeited the use of her eyes for months, not to mention the positive suffering she endured.

Do not read lying down. Owing to the position, the eyes are more than usually full of blood, and the muscles are unduly strained because of the practical impossibility of holding the book squarely before the eyes. For a similar reason, do not employ the eyes in a stooping position; it obstructs the return flow of blood from the head and eyes. "Carry the book to your eyes, and not your eyes to the book."

Eschew the pleasures of book or newspaper while riding, unless the vehicle be very steady. The work of adjustment is greatly increased by the shaking of the letters; the eye has "to take them on the fly," as it were, and it is very fatiguing. It should never be done, even on the smoothest railway, if the eyes are not perfectly strong.

Never sew on black at night. Black absorbs so much light that no ordinary artificial source can afford enough for its proper illumination.

Whenever the eyes become tired and uncomfortable stop work and rest them awhile. If you persist in using them after the warning, you will be apt to suffer for it. If the fatigue and discomfort be so marked as to amount to weak sight, seek advice from some competent physician, who will nearly always put you in the way of obtaining permanent relief.

If old enough to wear specs, put them on as soon as you feel the need of them; which is to say, when you catch yourself holding your book farther off in the day and abusing the lamp and the print at night.

Plenty of sleep is important. When the eyes are weak, it is a necessity. Should you have children, observe them while using their eyes, and if they hold the book too near or if they complain of them, examine into the matter carefully. By following the directions given at the end of this discourse, you can form some idea of the trouble yourself, though only the skilled physician can relieve it. Being ambitious and studious, do not urge them to still greater tasks for the gratification of your own pride and run the risk of irreparably damaging their eyes or ruining their health for life; but judiciously curb their enthusiasm, impressing upon them the important truth that the sound body is as necessary as the cultivated mind. I have been shocked at the folly sometimes exhibited by parents in this respect.

GLASSES.

Glasses for the young, owing to the peculiar character or the serious nature of the defects occurring among them, should always be selected by some one thoroughly familiar with the subject. Says a well-known writer: "The selection of glasses for short-sight requires great care, as much harm may be done by using those that are too strong or that are not properly fitted to the eye. In many cases the plan of 'trying' the various glasses on the optician's counter—or, far worse, in the peddler's box—is about as rational and safe as it would be, in case of sickness, to *try* the contents of the various bottles on the druggist's shelf without a prescription." But in old sight it is not so serious a matter, and at the end I append a simple rule for the selection of such glasses that may prove a help to some of my readers.

Spectacles are, as a rule, better than eye-glasses, because the lenses are kept in the right position more easily, though the latter are often very handy, especially when the specs become mislaid, as they frequently do when not worn constantly. In such cases, if expense be not an item, it is very convenient to have both. The frames are a matter of taste only, provided they fit the face properly, so as to put the centre of each lens opposite each pupil and the right distance from the eye. Steel frames are most generally worn, but for constant use in summer some non-corrosive material is better, and even gold is more economical in the long run.

All glasses are equally good, provided they are equally homogeneous and transparent, the only difference between them being in the curvature of their surfaces. "Pebbles," while much more costly, have no special virtues over glass, other than greater hardness, and consequent less liability to scratch, and a little less weight in the higher numbers. Quite often they are much inferior to glass, because, being cut from a natural and peculiar product, fluor-spar, they must be made with great care or they are much worse than glass, and that care is not always bestowed on them. Be not deceived by the oily-tongued venders of spectacles travelling through the country. The truth is not in them, and they usually charge from two to ten prices. If you are so unfortunate as to need glasses, and feel equal to selecting them for yourself, buy them from some optician or jeweller in your nearest town whom you *know* to be a man of character.

From $1.50 to $2.50 is ample for the best glasses in good steel frames, and from $5 to $10 in gold, unless the lenses be of the peculiar kind required in astigmatism or a combination of different sorts.

BLINDNESS.

In considering the care of the eyes in its relation to blindness, we must deal with the diseases and injuries to which they are liable. For a thorough exposition of the subject volumes would be required, such has been the progress in this branch of medicine; but of course in a publication of this kind it is only intended to call attention to certain facts in connection with them that ought to be in the possession of everybody, as a general knowledge of them would annually save this most precious of the senses to very many.

Having already, in the first division of our subject, dwelt upon the diseased conditions associated with near-sight which sometimes cause the loss of vision no further allusion will be made to them.

By long odds, the most frequent of the diseases practically interesting to us is an inflammation of the delicate membrane covering the front of the ball and lining the under surfaces of the lids called the *conjunctiva.* There are many varieties of this, but the symptoms common to all of them are redness of the eyes with more or less swelling of the lids and a discharge of mucus or matter. The severity of these symptoms is an index of the gravity of the attack. The discharge is *highly contagious,* and, as the matter from a mild case may excite an attack of dangerous severity in another, the most scrupulous cleanliness should be observed, and no one should be permitted to use the same wash-bowl or towels as the patient.

A familiar illustration of this class of diseases is the common "sore eyes" which goes through the country every few years, and which, it may interest you to know, is technically known as catarrhal conjunctivitis or catarrhal ophthalmia. It is generally of a mild type, with a tendency to recovery, and is, for the most part, treated without the aid of a physician, and usually with success. But just here I must sound a note of warning against the use of any preparation of *lead.* I mention this, because if the clear "watch crystal" becomes ulcerated, as it sometimes and not very infrequently does in this disease, the lead becomes deposited on the rough surface of the ulcer in the form of its insoluble carbonate, or white paint. It sticks so closely that it cannot be satisfactorily removed without damaging the eye, and is occasionally the cause of its total loss. I have seen a number of such cases. A popular old remedy known as "Thompson's eye-water" is said to be one of these lead preparations, and should never on that account be used, as it cannot be predicted when these ulcerations may occur. Any simple astringent, as alum-water, a teaspoonful to a pint, or borax-water, twice as strong, a few drops in the eyes three or four times a day, or simply bathing the closed eyes for fifteen or twenty minutes at a time several times a day with water as hot as can be borne, will answer; but if the eyes become decidedly painful and sensitive to light, and especially if the transparent part appear smoky or rough, seek your physician immediately, as the eye is in danger and more careful treatment is necessary.

The gravest of this class is the inflammation which comes on during the first week of life, usually in the first three or four days after birth. It is the most frequent cause of hopeless blindness, 30 *per cent.* of the inmates of the blind asylums of Great Britain having lost their sight from it, and in the United States 32 *per cent.* of those blind from preventable disease tracing to it. And the pity is the greater because it is very amenable to proper treatment, and this fearful loss of sight must therefore be largely attributed to either ignorance or neglect. It can be easily recognized by the symptoms common to the class mentioned in the beginning—viz., redness and swelling of the lids, with a *discharge of matter,* occurring shortly after birth. In view of its dangerous and, in bad cases, rapidly destructive character (twenty-four to forty-eight hours sometimes sufficing to compass the loss of the sight), no time should be lost in trying breast-milk, rotten apple, tea-leaves, alum curd, or other infallible remedies of the monthly nurse, but the physician should be called *at once.*

But do not sit idly by doing nothing until he comes, for good doctors are apt to be busy men, and it may be several hours or longer before he can get round, especially if it be in the country, and the child's sight may be lost in that time. The first thing to do, if only one eye be affected, is to try to prevent the infection of the good one by matter from the first, and the simplest method of doing this is to seal up the good one. Put a piece of soft clean cotton over it, and cover the whole with sticking-plaster, special care being taken to see that it is securely glued down on the dangerous side. For the same reason the child should, as far as possible, lie on the affected side and the hands should be secured. But both eyes are nearly always involved from the beginning. As cleanliness is the most important part of the treatment, set to work to cleanse, and *keep* the eyes clean, repeating the washing as often as every half hour if necessary. Separating with the thumb and forefinger of the left hand the lids of the lower eye (the child lying on his side), let a stream of the borax or alum-water, mentioned above, from a sponge or cloth saturated with it run between them upon a folded towel previously placed under that side of the head, and repeat until the matter is all washed out. After the doctor comes attend carefully to his directions, and *carry them out to the letter day and night,* for in the bad cases of this disease eternal vigilance is the price of sight.

In all those eye troubles characterized by a dread of light, watering of the eyes, particularly on exposure, and pain, especially if it extend to the brow, temple, side of nose, and perhaps run up into the head, very important structures are almost surely involved and medical aid should be obtained without delay. Irreparable damage may result from waiting only a few days.

Elderly persons who observe rings or rainbows around the lamp, and who suffer from occasional attacks of dimness of sight, are threatened with a disease known to oculists as *glaucoma.* Should the dimness persist for twenty-four hours, especially if accompanied by pain in the eye or head, let not another day pass without obtaining skilled advice. The results of *prompt* treatment are among the most brilliant in surgery; absolute and hopeless blindness, often accompanied by great pain, is the consequence of neglect.

Cataract is the most common cause of curable blindness. It is simply a cloudiness or opacity of the crystalline lens, so that cataract is *in* the eye, not *on* it, as we often hear it said. It may occur at any time of life, but nearly always at the two extremes, being often congenital, but usually one of the results of age. A gradual failure of sight, presenting the peculiarity of being better in a dim than in a bright light, at twilight than in the middle of the day, is very suggestive—quite characteristic indeed of certain partial cataracts occurring in the young; but the nature of the disease is rendered certain by the appearance of the pupil, which, instead of being black as in health, is gray or white. The pupils of all old persons are somewhat grayish, from the natural hardening of the lens, but their sight is good. The blindness is relieved by the removal, by a delicate surgical operation, of the opaque lens; and such has been the progress in this branch of medicine that, taking the average, over 90 per cent. are restored to sight. It is peculiarly important that the cataract of infancy and childhood should be removed during that period of life, because by obstructing the light it prevents the development of the nervous apparatus of the eye from want of exercise. Neglect to have it done is the more inexcusable on the part of parents because the operation is not a difficult one, and is not often followed by bad results.

Tobacco Amaurosis is a form of blindness that results from the excessive use of tobacco. It is an affection of the optic nerve, and there are no visible changes in the eye, the only symptom being a gradual failure of sight. Abandoning the habit, sight is almost sure to return under a tonic treatment.

Floating Specks—or Muscæ Volitantes, as they are technically called—are small spots of various shapes, or more or less translucent bodies, singly or in strings like beads, which are seen floating about in the field of vision upon looking at a bright surface. They are merely shadows cast upon the retina by minute opacities in the vitreous humor, and, sight being good in other respects, they mean nothing. Any one can see them by looking at the sky or a white wall through a pin-hole in a card.

Color-Blindness is a peculiar affection which, while it may be caused by disease, is generally congenital. Sight for ordinary purposes is of normal acuteness, but certain colors, most commonly red or green, cannot be correctly distinguished. It is very much more frequent among men than women (3 or 4 per cent. to much less than 1 per cent.). Practically, it is interesting and important in its relation to the employees of railways and steamboats, who are governed by colored signals. The question of life and death being involved in the correct reading of the signals, all such employees should be carefully tested in this respect before being taken on.

Accidents and Injuries.—Certain wandering denizens of the air, such as moths, cinders, gnats, etc., frequently find their way into the eyes, and few of us have not felt "what small things are boisterous there." Entering with comparatively little force, they are not imbedded in the tissues, but are usually found lying between the ball and one or the other lid, generally the upper. This being so, they are sometimes very easily removed by pulling down the upper lid over the lower, so as to wipe the under surface of the former by the lashes of the latter. Failing in this, it is not worth while to waste time on flaxseed, the popular remedy—which acts, if at all, by getting between the lid and ball, lifting it off, thereby giving the tears a better chance to wash the foreign body out—as prompt relief can nearly always be secured by a little simple manipulation on the part of a friend. It is done in this way: Place the point of an ordinary lead-pencil or other small rod horizontally on the upper lid about half an inch from its edge; grasp the lashes firmly with the other hand, hold the pencil steady, tell the patient to "look down," and just as he does so turn the lid quickly over the pencil, and, nine times out of ten, you will find the mote or cinder sticking to it. Having found it, wipe it gently off with either a handkerchief, a twisted piece of paper, or, best of all, a small soft brush made by wrapping a little cotton around the end of a match.

Workers in metal and stone are liable to more serious invasions by flying fragments of the material in which they work. These minute pieces of steel or stone fly off with so much force that very often they are imbedded in the clear front of the ball. An attempt may be made to remove them with the brush just spoken of or with a bluntly and smoothly-pointed stick of soft wood; but if it is not easily and quickly done a more skilful hand should be sought, as repeated efforts might seriously damage the transparent cornea. Prevention being better than cure, such artisans should always wear while at work strong eye-protectors.

Quite often these foreign bodies are of sufficient size, and strike the eye with force enough, to penetrate its walls and let out some of its humors, the most common being fragments of gun-caps and splinters of wood which fly up in chopping. Injuries of this character are of such serious import that no intelligent person would fail to shift, as soon as possible, the responsibility on his medical attendant. There is sometimes in these cases a special reason for seeking his help. If the cut through the coats lie in what is called the "dangerous region," which is a belt of the white of the eye about one-eighth of an inch wide lying immediately around the colored part, and especially if the missile be still within the ball, there is great danger of exciting in the sound eye the dreaded sympathetic disease, which, when once established, is practically hopeless, causing nearly always complete and irremediable loss of sight.

Not seldom the eyes are injured by caustics of one kind or another, the most frequent being unslaked lime in fresh mortar. In such cases a little castor or sweet oil should be immediately dropped into the eye, and then the lime washed out with water.

TESTS OF VISION.

In the types below numbered 1 and XX. we have the tests respectively for near and distant vision. The perfect eye should distinguish No. 1 at one foot, and No. XX. at twenty feet, the retinal images of the two being of the same size at those distances.

The power of accommodation being normal, No. 1 should be read, with an effort, as near as three inches at the age of ten; four inches at twenty; five and one-half at thirty; and eight at forty. When this "near point" recedes beyond nine inches, which it usually does about forty-five, it is time to put on spectacles. The rule for their selection is simply, in a few words, to put on a convex glass strong enough to bring it up again to nine inches. If nearer than that the glass is apt to be uncomfortably strong, while if it is not brought within ten inches it is not likely to afford complete relief, especially at night, when a rather stronger lens is needed than will answer under the brilliant illumination of daylight.

A person who can read No. XX. at twenty feet, and cannot read No. 1 as near as he ought at his age, is almost certainly moderately far-sighted.

One who can read No. 1 as he ought, but cannot make out No. XX., is moderately near-sighted. If No. 1 be very distinct at a nearer point than one foot while distant vision is very bad, the person has myopia of a higher degree.

One who can distinguish neither at the proper distance is either astigmatic or very far-sighted—or over-sighted, as now appears to be the better term—or very near-sighted. In astigmatism and far-sight both near and distant vision are relatively much the same, equally good or bad. In high degrees of near-sight distant vision is proportionally very much worse.

No. 4.[*]—NONPAREIL.

The place of our retreat was in a little neighborhood, consisting of farmers, who tilled their own grounds, and were equal strangers to opulence and poverty. As they had almost all the conveniences of life within themselves, they seldom visited towns or cities in search of superfluities. Remote from the polite, they still retained the primaeval simplicity of manners; and frugal by habit, they scarce knew that temperance was a virtue. They wrought with cheerfulness on days of labor, but observed festivals at intervals of idleness and

XX.

Y A C E G L

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[*] No. 1 is Brilliant type, one-fourth the size of Nonpareil, which is the smallest the printer has. Allowance must accordingly be made.

THE CARE OF THE EARS.

Considering man merely as a constituent element of the community, deafness is not so serious as blindness; but in its relation to the happiness of the unfortunate individual it is generally regarded by those having opportunities of observation as the worse of the two.

The deaf never receive the sympathetic consideration universally accorded to the blind on account of their physical helplessness, but, on the contrary, are often treated with impatience, if not with positive harshness. In addition, they are frequently harassed by subjective sensations—noises of various kinds "so exquisitely distressing," says Politzer, the greatest authority on the ear, "as to undermine often both the physical and moral powers of the individual, and in some cases even to lead to suicide." Their dispositions suffer in consequence, and they are apt to become sensitive, suspicious and reserved. This is peculiarly the case with those who lose their hearing in childhood while their moral natures are even more soft and pliant than their physical bodies. So deafness is very much more of an affliction than those with good hearing are prepared to admit.

The ear is made up of three divisions: a sound-collecting, a sound-transmitting, and a sound-receiving apparatus.

With the first of these every one is familiar in the peculiarly-shaped external ear or auricle. The waves of sound, having been collected by this, traverse the auditory canal, which is about an inch and a quarter long, and fall upon a delicate membrane stretched tightly across the inner end of it. This, in ordinary conversation, is often spoken of as the "drum of the ear," but it is, in fact, only the drum-*head*, or tympanic membrane, the drum being a cavity with other parts in addition. Fastened to the inner surface of this drumhead is the first of a chain of three tiny bones, called the hammer, the anvil, and the stirrup, from their resemblance to those objects, united, as other bones, by joints (which sometimes, like them, become stiff) that extend across the drum-cavity. The end of the last one, the foot of the stirrup, fits into an oval hole in the inner bony wall of the drum, which is the outer wall of the labyrinth. It lies immediately in contact with the fluid filling the labyrinth or inner ear, the sound-receiving apparatus, in which fluid the ends of the nerve of hearing are bathed.

The waves of sound striking against the taut drumhead, it is thrown into vibrations, and these vibrations are transmitted through the chain of bones to the fluid, and through that to the nerve. This, in brief, is the mechanism of hearing.

Connecting the drum with the throat is a small and crooked tube, about an inch and a half long, called the Eustachian tube. This tube, as well as the drum itself, is lined with the same mucous membrane that covers the throat. Indeed, the drum is, anatomically considered, an off-shoot from the throat. Such being the case, we would naturally expect the drum to suffer with the throat in disease. And the facts bear out the anticipation. Fully three-fourths of all cases of deafness are attributable to affections of the drum or conducting apparatus that are almost invariably associated with similar disease in the throat. Although persons hard of hearing may not complain of the throat, it very rarely happens that trouble cannot be found there if looked for. When we remember how exceedingly common colds and sore throats are, bearing in mind that the back part of the nose is a part of the upper throat, into which the Eustachian tubes enter, it is very evident why this form of deafness is so frequent.

Inflammations of mucous membranes are always accompanied by swelling or a discharge of mucus, generally both; and, keeping these facts in view, it is very easy to understand how these troubles cause deafness. The purpose of the Eustachian tube is to keep the drum full of air, and Nature has provided that it shall open every time we swallow or yawn, so that the air may enter easily if there be need for it. You have, no doubt, often felt the air rush into the ears when blowing your nose violently, and felt a roaring in them when gaping widely.

Sometimes in fresh colds the membrane surrounding the mouth of the tube becomes so swollen as to close it, or it becomes stopped by a plug of mucus, and then deafness results, because the air in the drum is partially absorbed and cannot be replaced. In these cases, when the tubes are opened, the restoration of hearing is often magically instantaneous. It occasionally happens that hearing suddenly returns of itself with a sudden snap. The swelling, however, is not always, or even generally, restricted to the *mouth* of the Eustachian tube, but involves the length of the tube and the drum itself. Of course swelling in these situations, and especially the presence of a viscid fluid in so delicate an instrument as the drum, must seriously interfere with its proper working. In the acute forms of these troubles relief can generally be afforded, but when they are allowed to become chronic the changes in the tube and drum often assume a permanent character, and complete restoration to hearing is then impossible.

The moral to be drawn from this is, that deafness should be treated promptly in the beginning, before irreparable damage is done. This is peculiarly true of these troubles occurring in children, as they are then exceedingly amenable to treatment, while their neglect is liable to eventuate in permanent impairment of hearing.

In this connection it is proper to make a suggestion to teachers in regard to deaf children. They are necessarily at a great disadvantage on account of their infirmity, and are often accused of stupidity or inattention when the truth is they cannot hear. So, whenever there is any reason to suspect such a thing, carefully test the hearing by conversation across the room with the child's back to you, beginning with a whisper and gradually raising the voice, making him repeat each word after you. Ascertaining those who are deaf, seat them nearest to you, and *be patient with them*, remembering that one of the frequent results of deafness and its accompaniments is an injurious effect upon the disposition, and that probably, under similar circumstances, you would not be amiable.

Earache, a familiar enemy in most families with children, is generally due at first to a congestion of the lining membrane of the drum, and can usually be promptly relieved by *heat.* The heat may be applied in various ways—by cloths wrung out of hot water, raw cotton heated by application to the surface of a tin vessel filled with boiling water, flannel bags of salt or sand heated in an oven, or, best of all, a steady, gentle stream of water, as hot as it can be borne, for twenty or thirty minutes, into the aural canal. Sometimes simply breathing into the ear will give relief. The old-fashioned remedy of a boiled onion is not a bad one, but never apply poultices to the ear; they are liable, while giving temporary ease, to do eventual injury. Abjure spirits of camphor, kerosene, and such remedies: they do no good, and may do harm. If heat fails, call in your physician, and he may try the celebrated new remedy, cocaine, which sometimes succeeds in relieving pain in the ear, though it often fails, being by no means so satisfactory as in eye troubles.

The earache being neglected, and the congestion of the lining membrane of the drum going on to inflammation, mucus is poured out just as it is from the nose in a fresh cold. The Eustachian tube being also swollen, the mucus cannot escape by that, which is the only avenue, and so it accumulates, causing fearful pain, until by pressure upon the delicate drumhead it brings about its ulceration and perforation, allowing the mucus, which soon changes to matter, to find its way out through the external canal.

Otorrhœa—which means a running from the ear—is the technical name given to this state of things, and the cause of it, above set forth in detail, is commonly called "a rising in the head." You will note that a hole in the drumhead is one of its constant features. Notwithstanding the great damage to the ear, it is, owing to its common occurrence, and the fact that some cases do get well (that is, the running stops) without any special treatment, often looked upon by parents, and occasionally by physicians who have not quite kept up with the times, as a trifling matter, their advice in such cases being, "let it alone and he will outgrow it." But it is by no means a trifling matter. If neglected, the pus lying in the canal decomposes and becomes very offensive, making the poor child a stench in the nostrils of his associates. To illustrate to what extent this neglect has been carried in some few instances, it may be mentioned that living maggots have been found in the ear. Another consequence of a want of attention is much greater deafness than would have followed prompt treatment. But the evil effects of neglect of a running from the ear do not always end here. The disease may extend to the bone, and thence to the brain, the dividing-wall between the ear and the brain being exceedingly thin, and cause *death*. The wonder is that more fatal cases are not recorded, and, as it is, those who are not familiar with the subject would be shocked to know how many die from this cause. It need not be said, therefore, that they should always receive medical attention. The treatment is simple and the services of a specialist are not usually required, any well-informed physician being competent to undertake most of them. There certainly can be no excuse for not keeping them clean by daily syringing out the ear with warm water. All applications to the ear should be *warm*.

Wax, or a compound commonly called by that name, is a natural secretion of the walls of the aural canal of a yellowish-brown color and peculiar odor, the purpose of which, it is supposed, is to repel wandering insects. Quite often it accumulates until, by blocking up the canal, it causes deafness; which, by the way, generally comes on with more or less suddenness. It can generally be seen as a dark mass by an inspection before an open window, the auricle being pulled upward and backward to straighten the canal. It should always be removed, as its presence in a hardened mass is apt to prove injurious. Fill the ear nightly with warm soda-water (a teaspoonful of cooking soda to a tumbler), letting it remain fifteen or twenty minutes for three or four nights, to soften the wax, and then syringe somewhat forcibly with warm water. But, unfortunately, this syringing of the ear is not as simple as it sounds, nor is it entirely safe in inexperienced hands; so it is best to go to your doctor at once, especially as other changes are often associated with this accumulation, which will need attention.

Insects of various kinds frequently get into the ear, and by scratching the exquisitely sensitive drumhead with their claws, often cause frightful pain and the most terrific noises. (I was called from my bed early this morning to relieve marked distress occasioned by so harmless a thing as a common house-fly). When the presence of an insect is suspected, the ear should be filled with warm water, which will either run him out or drown him.

Foreign bodies, such as beads, peas, cherry-stones, etc., in the aural canal "should never be touched by incompetent hands." If they cannot be shaken out by jarring the head, the aid of an expert should be obtained, as a number have lost their lives from badly-directed attempts to remove them.

Injuries to the ear, through rupture of the drumhead, sometimes result from the violent concussion due to a loud explosion, as of a large cannon. Now and then it is a consequence of a concussion of a more homely and every-day character—to-wit, a box on the ear. As "there are a few well authenticated instances of death having occurred from this barbarous custom," it is superfluous to add that it is "more honored in the breach than in the observance." The drum is sometimes injured by sharp instruments, such as hairpins, knitting-needles, toothpicks, etc., and my reader is warned against scratching the ear in any such way. Never put any instrument in the ear, except your finger; you cannot get that deep enough to do any harm.

Before concluding, I must again direct attention to the importance of looking after those every-day troubles, earache and "rising in the head." To their neglect are attributable a great many cases of incurable deafness, and some of death.

UNIV. OF MICH.
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SECOND BIENNIAL REPORT

OF THE

North Carolina Board of Health,

TO THE

GENERAL ASSEMBLY OF NORTH CAROLINA.

SESSION OF 1889.

RALEIGH:
JOSEPHUS DANIELS, State Printer and Binder,
Presses of Edwards & Broughton.
1889.

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NORTH CAROLINA BOARD OF HEALTH,
Secretary's Office,
WILMINGTON, January 9th, 1889.

His Excellency ALFRED M. SCALES,
Governor of North Carolina:

SIR:—In accordance with Section 2 of the "Act relating to the Board of Health," I have the honor to present this, the second biennial report of the North Carolina Board of Health, under the amended law, ratified by the General Assembly on the 9th March, A. D. 1885.

Very respectfully,
Your obedient servant,
THOMAS F. WOOD, M. D.,
Secretary and Treasurer.

MEMBERS OF THE BOARD.

J. W. Jones, M. D., President.................................Tarboro.
Term Expires 1889.
Thomas F. Wood, M. D., Secretary and Treasurer.......Wilmington.
Term Expires 1891.
Richard H. Lewis, M. D..Raleigh.
Term Expires 1893.
W. D. Hilliard, M. D...Asheville.
Term Expires 1891.
*J. L. Ludlow, C. E..Winston.
Term Expires 1889.
H. T. Bahnson, M. D...Salem.
Term Expires 1893.
Prof. W. G. Simmons...Wake Forest.
Term Expires 1889.
John McDonald, M. D.......................................Washington.
Term Expires 1889.
J. H. Tucker, M. D..Henderson.
Term Expires 1889.

*Chosen by Gov. Scales to fill unexpired term of Mr. Arthur Winslow, he having removed from the State.

STANDING COMMITTEES:

Epidemics....................................Drs. Wood and Jones.
Water Supply and Drainage.......................Dr. H. T. Bahnson.
Hygienics of Public Schools.Dr. W. D. Hilliard, Mr. J. L. Ludlow, C. E.
Illuminating Oil..................................Prof. W. G. Simmons.
Climatology...Dr. J. W. Jones.
Adulteration of Foods and Medicines....Drs. McDonald and Tucker.
Sanitary Condition of State Institutions.......Drs. Lewis and Jones.
Vital Statistics........................Drs. Wood, Lewis, Bahnson.

SECOND BIENNIAL REPORT

OF THE

North Carolina Board of Health.

REPORT OF SYNOPSIS OF WORK DONE BY THE NORTH CAROLINA BOARD OF HEALTH, MADE BY THE SECRETARY TO THE CONJOINT SESSION WITH THE MEDICAL SOCIETY OF N. C.

SYNOPSIS OF WORK DONE FOR 1887–'88.

[Report from Thomas F. Wood, M. D., Secretary of the North Carolina Board of Health.]

The work of the Board is still confined to elementary principles. It was recognized at an early day that eventual success must be based upon the spread of the knowledge of hygienic principles, and without this foundation no considerable superstructure could be built.

Mortuary Reports from Towns.—No better instance of the slowness of sanitary teaching need be cited than that of the returns from our towns. Wilmington was, for a long time, the only one reporting, and it is interesting to recall how critically the reports from that town were commented upon by newspapers in non-reporting towns. The disadvantage seems to be enough at times to induce the Superintendent of Health to give up the publication of them; but time has shown the wisdom of persistently giving to the public the actual state of mortality, both as regards the actual state of things it portrayed and as an example to the other towns of the State.

In November, 1886, we were enabled to publish in the *Bulletin of the North Carolina Board of Health*, the mortality returns of four towns, viz: Wilmington, Charlotte, Asheville and Fayetteville, having begun probably in the order of date as named above.

In the December report, Raleigh was added to the list, but failing for the next three months to be reported. At the date of this report there are fifteen towns reporting, viz: Wilmington, Charlotte, Asheville, Fayetteville, Raleigh, Durham, Newbern, Goldsboro, Henderson, Washington, Tarboro, Salisbury, Statesville, Oxford and Greensboro. The basis of these reports is the record of the keepers of cemeteries, received through the keepers themselves, or through the mayor of the town, or Superintendent of Health, or whoever could be induced to give the statements. It is, then, believed that such reports may be relied upon as approximately correct, making some calculation for the irregular burials resorted to by the colored people and some whites who are driven to seek a spot of ground beyond the control of city authorities, in order to escape the cruel tax which the extravagant fashion of burial now imposes upon white and black, rich and poor. This has gradually been corrected in Wilmington, where a regularly organized burial place, under a responsible keeper, has been established, so diminishing the error.

Another source of error is also to be considered. In all towns there is a rivalry about the increase of population, and as we get farther away from the last census, the temptation to estimate the population has been great in all the towns. Wimington, by the census of 1880, had 17,360, but now a new estimate has been placed upon it. Following a practice in some other States, the population is estimated upon the record of registered voters. As ascertaining the number of voters this is multiplied by five, which is believed to be approximately correct. The fallacies of this must be apparent. For instance, the census preceding an election in which there was great excitement by reason of vital issues, and thorough canvasses by good speakers, would be much larger than where there is general apathy. The tendency is to over-estimate population, and it may be safely considered that the mortality reported is under rather than over the mark.

The desire of the Board is to agree upon some estimate of population, and to impress upon authorities to see that no burials are permitted except upon the certificate of some physician or duly authorized person.

One other source of inaccuracy may be noted in the diagnosis of causes of death. All physicians are not equally careful in making diagnoses, or even equally competent.

Sometimes they state merely the last cause of death. For instance, naming "convulsions" as the cause of death, when the real disease might be "hemorrhage," or "asthma," the "hemorrhage" signifying really aneurism of the aorta, the sac bursting into the trachea. The most common cause is probably the post mortem diagnoses, which are made by Superintendents of Health. In few cases have they the time, or are they encouraged by the prospect of a fee to make a thorough post mortem dissection, to ascertain the cause, perhaps, in no other cases than such as are ordered by the coroner. The Superintendent, therefore, has to rely many times upon the narration of symptoms gathered from ignorant friends.

The rectification of the above errors we must strive for, the ascertainment of truth being the desirable thing, and not the purpose of making one town more healthful than another, numerically.

The number of counties reporting has increased from forty-two in our April, 1887, *Bulletin*, to fifty-eight in our January, 1888, *Bulletin*, and the number is slowly increasing. The character of the reports need not be commented on here, but the desire on the part of most Superintendents is to do better, their success depending very largely upon the unanimity and intelligence of physicians in the different counties.

Epidemics.—During the past year no considerable serious epidemics have happened. In Wilmington, *scarlet fever*, which had lingered as a sporadic disease for a few years, finally gathered force enough to be considered epidemic; although there were hundreds of cases, there were not to exceed a dozen deaths from this cause.

Measles were unusually widespread in the eastern counties, especially Columbus and New Hanover, but even the remote causes of death made the mortality below the average in this disease.

Cerebro-Spinal Meningitis.—After an exemption of nearly twenty years, quite a sharp outburst of this disease occurred in Buncombe, principally in Asheville, claiming the usual number of victims. It occurred also in scattered cases in other counties of the west, but not in an epidemic form. We are hoping to get a thorough investigation of the causes of the outbreak, as this disease may be fairly considered a preventable one.

Small-Pox.—The whole country was on the lookout for this disease this year, and the *Conference of State Boards of Health* agreed upon a notification of the occurrence of cases to each board represented in the Conference. The State of California made the first report, then Louisiana, then Kansas, then Tennessee, then Maine, then Pennsylvania, then North Carolina, and so on in pretty quick succession, the port of New York being the source of importation in most of the cases.

In March, Dr. James Spicer reported by telegram that a case of small-pox had broken out, asking for vaccine to be sent. This was done immediately. We were then informed that the patient was a foreigner, who had come to work recently in a furniture factory in Goldsboro, and who had come in contact with fellow workmen and boarders. The case was removed from town, and vaccination was resorted to. The promptness of action was rewarded by the restriction of the disease to this one case. April 11th being the 14th day from the outbreak, and the possible contact of persons with the sick man, and for the next few days there being no occurrence of another, all anxiety passed away.

Here is a note from Dr. M. E. Robinson, giving an account of the case:

GOLDSBORO, N. C., April 12th, 1888.

Thomas F. Wood, M. D.:

DEAR DOCTOR:—One Thomas Read, of Scotch descent, shipped from Glasgow on the 23d February last, on steamer Circassia, which he says had a case of small-pox on board which died. They arrived at New York and were quarantined for only nine hours and were all vaccinated and let loose on the country. I was called to see him on March 26th. On the 27th he broke out with an eruption which looked very suspicious. I called in Dr. Cobb. On the 28th called in Dr. Kirby. At first we thought it was measles, that is, on the 27th; on 28th pronounced it small-pox, and at once quarantined it. He is now about well—able to keep up and about the house.

We have been fortunate not to have another case.

Very Respectfully,

M. E. ROBINSON.

Suspected Small-Pox.—June 6th, 1888, a telegram was received from Dr. N. Anderson, the Superintendent of Health of Wilson, notifying the Secretary of a case of disease suspected to be varioloid.

WILSON, N. C., June 6th, 1888.

Dr. T. F. Wood, Wilmington, N. C.:

MY DEAR SIR:—There is a case of eruptive fever in town and there is very grave suspicion that it is one of varioloid; in fact, one of the physicians called in to see the case is not at all doubtful, but upon very careful enquiry as to history, etc., there is much doubt thrown around the whole matter. As an act of prudence, however, I have directed that the case be removed to the country and isolated. To satisfy the citizens

of our town, as there is an amount appropriated by the State for such purposes, I would respectfully request that you send an expert to-morrow to see the case.

Very truly yours,

N. ANDERSON.

Vaccine matter was promptly forwarded and the patient isolated. Doubts and apprehension still hung around the case and a member of the State Board was sent to investigate it.

The patient, a citizen of Wilson, had been discovered to have an eruption, which was pustular and covered the whole body. For some weeks he had not been away from Wilson, and then had been residing or visiting localities where there was no small-pox. There could hardly be a more difficult matter than to determine the exact nature of this disease. The pustules were distinct, round, pustular, in some places umbilicated. Inspection and inquiry revealed these facts: The patient had no initial fever, backache, frontal headache; the eruption did not begin on the forehead and pursue a regular course on the neck, arms, chest, etc., but was as much, in the beginning, on the legs and body as elsewhere; crusting, which was just begun, was not in the usual order on the face, but scattered about; the patient had been vaccinated within a few years, but the eruption dimmed the cicatrix, if there was any of a well marked character; the odor of the body was not characteristic; the sore throat was not that of small-pox. Altogether, there was hardly ever to be imagined a case so nearly like small pox not to be one, and a person with a like eruption during the prevalence of small-pox, would almost without question, be hustled off to a lazaretto. The deciding point lay in the fact that the patient had a hard-chancre still uncured, settling the diagnosis as one of pustular syphilide.

The announcement of this conclusion by the consulting physicians allayed the alarm of the community, rendering thereby, the sort of assistance so much needed, and which the State Board has been careful to apply. The management of panics, the arrest of idle rumors, and the restoration of confidence is hardly secondary to the prompt isolation of disease.

The epidemic fund of the Board held in reserve for the emergency of an epidemic outbreak has never been drawn upon, but is sufficient for all purposes; it is under the control of the Governor. The State Board, though, does not hesitate to send means of prevention with all dispatch to localities where it is needed. Vaccine we keep constantly within reach in a fresh state, but the Board does not attempt to furnish it gratis, as no provision is made for it. There is a provision for it in the general law, making the expense in emergency devolve upon the officials of counties.

YELLOW FEVER IN THE SOUTH—ITS EFFECTS UPON TRADE AND TRAVEL—THE DANGERS OF PANIC.

During the winter of 1887, there were rumors of a disease which made its appearance in the Peninsula of Florida, being infectious. During the early Spring of 1888, cases occurred in Jacksonville, which, before midsummer, were known to be yellow fever. The reports were very conflicting as to the nature of the disease, and Florida having no Board of Health to give authentic information, rumors of the wildest sort spread all over the country. The alarm which succeeded these reports could hardly have been greater at the immediate points of danger than at points very remote, especially in such towns and cities as had once been the victims of the disease. The most shameful panic overcame some communities, and the disgraceful shot-gun policy, with which the public is so well informed, was inaugurated as the proper thing to avert disaster. Men, women and children, fleeing from the enemy, were detained or refused admittance to towns; railroad travel was interrupted, and trade of all sorts hampered or ruined.

In our State, the greatest danger was apprehended as to the sea-coast towns, as they had had yellow fever once in their history, and were in more direct railroad communication with Florida.

Wilmington established inland quarantine in July and kept it up until November. Little could have been done but for the hearty coöperation of the officials of the Atlantic Coast Lines. Dr. F. W. Potter, acting by the advice and with the hearty support of the County Board Health, had placed at his command means adequate for the emergency. The Mayor of Wilmington, Hon. John J. Fowler, gave hearty acquiescence, and rendered excellent service in his official capacity, and as a private citizen. Two policemen, selected for their judgment and intelligence, were stationed at the Navassa Guano Factory, four miles from Wilmington, on the west side of the Cape Fear River. Fearing that this would not be sufficient, additional officers were sent, one to Florence, S. C., and one to Maxton, N. C., to detect the attempt of any coming by circuitous route from Florida, warning any such that they would not be admitted into Wilmington without being detained at an improvised quarantine station. The officials of the Atlantic Coast Line were as anxious to keep out persons from the suspected districts as the Board of Health officials, and they acted with prudence and forethought, inflicting as little inconvenience as possible on the through northern travel. A dining car was placed at a convenient distance from the town, and the cars properly fumigated by sulphurous acid fumes. These precautions excited considerable alarm among the ignorant and timid, and some suspects, a family or two from the infected district, having been detained for observation until they could be sent in the country, were suspected of having the fever, and the suspicion grew into a rumor, and a rumor into a positive statement that there was actually a case of yellow fever in Wilmington. Panic now became wide-spread, and the old popular delusion of burning tar-barrels was resorted to, as a means of purifying the air and warding off danger. In the meantime, telegrams of enquiry were rushing in from distant towns, and the whole population for miles around was in a state of ferment.

During this excitement a vessel came in to the Cape Fear River from New York laden with railroad iron. As soon as it was known that the quarantine officer at Southport had informed the Wilmington members of the Quarantine Board, according to his usual custom, that this vessel several weeks before had been in Jacksonville, more fuel was added to the flame. The Wilmington members of the Quarantine Board, in the regular discharge of their duty, visited the quarantine station to inspect this vessel, and while on board received telegrams from Wilmington, protesting against this vessel coming up to Wilmington on any terms, and even suggesting the impropriety of the members of the Board visiting the vessel. A close inspection revealed the fact that the vessel was in Jacksonville some days before the first case of yellow fever had been reported in that city; that she loaded a mile from the town; that her crew had not been ashore, and being mostly Scandinavians, a people more susceptible than usual to yellow fever; that several weeks had elapsed since her departure from Jacksonville. She had gone to New York and received a cargo of iron rails. The storage of such cargo is of such a nature that it can be easily examined, and also the entire hold of the vessel. Everything was found in good sanitary condition, there was no sickness on board, and the unanimous opinion of the Quarantine Board was that the vessel should be accorded free pratique into our port. In deference, however, to the respectable citizens who had entered their protest to her admission, we asked for an interview with such representatives of the people, with the County Board of Health, as were willing to meet us. Accordingly, the meeting was held, the state of the case as regards the vessel clearly set forth, and a free expression of opinion asked for and given. After this the two members of the Quarantine Board expressed their belief as to the justice of this vessel being allowed to come to her wharf in the city, in peference to a resolution, pratique was refused for the present.

The formal resolution was then introduced setting forth the reasons why the representatives of the several interests of the city were opposed to the admission of the vessel, endorsing at the same time the action of the Quarantine Board, and making themselves responsible for her detention.

In effect, this was an organized, but very respectable opposition of the Quarantine laws. It was all the more embarrassing because some members of the county Board of Health were also members of the Quarantine Board, and the law sets forth that maritime quarantine "shall not be interfered with, but officers of the local and State boards shall render all aid in their power to quarantine officers in the discharge of their duties, upon request of the latter."

Furthermore, it was admitted by the members of the Quarantine Board present, that the means of disinfecting vessels at Southport were of the most primitive character and not at all adequate to the complete sanitary preparation of vessels. It was very evident in summing up the whole discussion for and against, that as citizens and health officers we were not only performing the functions of sanitary experts, but were called upon also to manage a panic which was threatening to disorganize the trade of Wilmington. It seemed prudent, therefore, to allow the objectionable vessel to remain at her anchorage at the station, until the community had reached a calmer and more reasoning state of mind. The hardship to the vessel was great, and in reality her expenses should not have, and would not have fallen so heavily, had there been at the station efficient means of sanitation. This description of the difficulties of a panic serve to demonstrate the necessity of State action to save our commerce from unjust losses by the erection of a proper quarantine, of which there will be mention under the head of quarantinein another part of this report.

A Reported Case of Yellow Fever.

When the panic was at its height, there appeared in the public daily press a dispatch from a member and officer of the County Board of Health of Pender, stating that a case of yellow fever had occurred in that county.

Dr. W. T. Ennett, the Superintendent of Health of Pender county, was telegraphed to, and in addition to his telegram in reply saying that he had received no information, sent also the following:

> **Burgaw, N. C., September 19th, 1888.**
>
> ***Dr. Thos. F. Wood:***
>
> **Dear Sir:—I received your telegram this morning and answered at once. We had heard nothing of the case till we read your telegram. I wrote at once to Dr. Murphy asking him the particulars, when I hear from him I will notify you at once, or, if he does not reply, had I not better go and examine the case.**
>
> **Respectfully and truly,**
>
> **W. T. ENNETT.**

Later the following in substance was received from the Superintendent of Health, Dr. Ennett:

> **He found the man Anderson [suspected to have the yellow fever] lives twelve miles from Burgaw, beyond the Northeast River, and he was then up and out of doors and eating regularly and seeing his neighbors that day, they were as much surprised as I at the report. From what I could gather, I decided it was "Hemorrhagic Malarial Fever."**

This added more fuel to the flame, and telegrams came pouring in, making enquiry as to the genuineness of the case. The Secretary of the Board secured the valuable services of Dr. William J. Love, of Wilmington, an expert in yellow fever, he having served during the epidemic in Wilmington in 1862, and having suffered from the disease in his own person, to visit the spot and determine the truth or falsity of the report.

The following is his report:

WILMINGTON, N. C., September 20th, 1888.

Dr. T. F. Wood, Secretary North Carolina Board of Health:

SIR:—I have the honor to report, that in obedience to your instructions, I visited Burgaw in order to investigate a case supposed to be yellow fever. The patient lives ten miles east of the town, across the Northeast Cape Fear River. He was taken with a chill at 8 p. m. on the 7th instant. During the night he was affected with nausea and vomited blood. The vomiting continued at intervals until the afternoon of the 9th assuming the character of black vomit. The alvine dejecta indicated hemorrhage. There was no epistaxis nor hematuria. Upon the subsidence of the vomiting, icterus presented itself. The temperature at no time went beyond 102 degrees F. There was some frontal headache and pain over hepatic region and in the abdomen, but no uneasiness about the loins and lower extremities. These points were kindly given me by the physician in charge. I saw the case this morning. The icteric hue of the skin had nearly subsided and the adnata presented no discoloration whatever. There was no fever and the man was able to be up and dressed. He is twenty-seven years of age, healthy and temperate. His last attack of sickness, pneumonia, occurred six years ago. His diet was the usual one on the 7th inst.

My diagnosis was paludal fever accompanied by gastric and intestinal hemorrhage, these being points, in a yellow fever panic, sufficient to excite the alarm and suspicions of the community. I was particularly impressed with the apparent insalubrity of the residence, situated in a neck between the river and a creek with cleared swamps to the east, south and west, embracing three-fourths of a circle, but the patient stated that he had very little sickness in his family, a remark corroborated by the medical man in attendance.

The patient had not been exposed to yellow fever infection, his only trip away from home having been a visit to Wilmington three weeks ago, his stay consuming but a day or two.

Very respectfully yours,

WM. J. LOVE.

Doubtless the reliance placed in this report served to allay excitement.

It is appropriate, at this point, to call attention to the necessity of physicians and others holding *quasi* positions as custodians of the public health. The eyes of the community are upon them, and any indiscreet or premature statement may result in widespread harm, as in the case above referred to. Letters of enquiry from railroad officials and boards of health of distant States, showed how fast the bad news had travelled, and how eager every one was to know what the State Board was doing about it. There seems to be no remedy for such indiscretion, except the reaction which rebounds upon the unfortunate or guilty perpetrator of premature or ill-judged opinions.

There is a proper way to proceed in reporting suspected cases, and it is clearly set forth by the law. It is the duty of every member of the County Boards of Health to report promptly to the Superintendent of Health of his county, any case of suspected pestilential disease. It is the duty of the Superintendent to examine into such cases and report them promptly to the Secretary of the State Board of Health, in order that proper action may be taken to prevent its spread, and to control panic in the business world.

In this connection the State Board makes the suggestion that there should be

COMPULSORY NOTIFICATION OF CONTAGIOUS AND INFECTIOUS DISEASES DANGEROUS TO THE PUBLIC HEALTH.

Prompt action is the only course of safety in dealing with pestilential diseases. The early detection of a case, and prompt isolation promises success. All physicians do not see the necessity for such action, or do not recognize the policy of prompt notification: some even act upon the principle that their cases are matters of private concern, with which public health officers have nothing to do, so that to obtain the best results, there should be a uniform rule of action.

THE COLONIZATION OF YELLOW FEVER REFUGEES IN HENDERSONVILLE.

The following correspondence was received at this office in reference to the colonization of refugees from Jacksonville in the mountain regions of the State:

[Telegram.] "JACKSONVILLE, Fla., Sept. 4, 1888.

THOS. F. WOOD, *Secretary State Board of Health:*

We have wired Gov. Scales, at the suggestion of Surgeon General Hamilton, M. H. S., for permission to send our people, not exceeding five hundred, who have means to go, to places in the mountains open to them. What restrictions will State Board of Health impose? Can you suggest names of places you would recommend, and the number they can accommodate?

NEAL MITCHELL, M. D.,
President Board of Health,
D. T. GERAW,
Acting Mayor,
P. McQUAID,
Acting President Auxiliary Association."

The following from Gov. Scales:

[Telegram.] "GREENSBORO, N. C., Sept. 9th, 1888.

DR. WOOD, *Secretary State Board Health, Wilmington, N. C.:*

Surgeon General Hamilton, M. H. S., advises authorities of Jacksonville to ask me if their citizens, not exceeding 500 in number, will be permitted to go to the mountains of our State to such places as are willing to receive them? What answer shall I make? Answer here, at once.

A. M. SCALES,
Governor."

Knowing that there were some towns willing to admit refugees from Jacksonville, I telegraphed Dr. W. D. Hilliard, of Asheville, member of the North Carolina Board of Health, to communicate with the towns in the mountain sections, ascertain what places would be willing to receive them, in what numbers, and under what restrictions:

[Telegram.] ASHEVILLE, N. C., September 7th, 1888.

Thos. F. Wood:

Hendersonville will receive five hundred. Hickory gives no number.

W. D. HILLIARD.

[Telegram.] MURPHY, N. C., September 6th, 1888.

Thos. F. Wood:

We can furnish local accommodations for one hundred, and as many more as have tents.

DR. ABERNATHY,
Superintendent of Health of Cherokee Co.

Pending answers from Superintendents of Health of the mountain counties willing to move in the matter, and awaiting their decision, the following was received:

[Telegram.] WASHINGTON, D. C., September 7th, 1888.

DR. THOS. F. WOOD, *Secretary State Board of Health, Wilmington:*

What conclusion have you reached in regard to allowing cars of refugees to go to the mountains of North Carolina.

HAMILTON, *Surgeon General.*

In the meantime, the following came:

[Telegram.] ASHEVILLE, September 8th, 1888.

Dr. Thos. F. Wood:

Waynesville extends cordial invitation.

W. D. HILLIARD.

The following letter from Dr. L. L. Johnson, Superintendent of Health of Henderson county, in reply to telegram, was received:

DR. WOOD, *Wilmington, N. C., Secretary State Board of Health:*

DEAR DOCTOR:—Yours of September 7th received. In reply I will say, that a telegram was received at Hendersonville from the President of the Board of Health, of Jacksonville, Florida, asking that they might send as many as six hundred of their people to this county. After consultation with the physicians and town council, we decided to throw our doors open to them. I require the clothing to be fumigated. Our

town is 2,252 feet above sea-level, and we cannot think that there is the least danger of any contagion. I will write you in regard to the matter if anything should occur.

Very respectfully,

L. L. JOHNSON, M. D.,
Superintendent of Health of Henderson Co., N. C.

In reply to a telegram to the Mayor of Hendersonville (the County Superintendent of Health, Dr. Johnson living in the country and not accessible by telegraph), asking what restrictions the County Board of Henderson had placed upon the refugees, the following was received:

[Telegram.] HENDERSONVILLE, September 8th, 1888.

THOS. F. WOOD, *State Board of Health:*

Letter not received; have made no restrictions; should we make any? if so, what, and how?

J. P. RICKMAN.

In reply to this, instruction was sent that the refugees, on arrival, should be paroled not to leave Hendersonville under ten days; that they should be kept under surveillance in order to prevent their entrance into towns where their presence would be objectionable.

The following from Asheville, in response to telegram, asking if that city would quarantine against Florida refugees:

ASHEVILLE, N. C., September 6th, 1888.

T. F. Wood:

Am instructed by Mr. Harkins, Mayor of Asheville, to say there has not been, nor is there, any quarantine against any one. Hickory and Hendersonville extend cordial invitations. Other points not yet heard from.

W. D. HILLIARD.

After ascertaining what towns would be willing to receive the refugees, telegrams were sent the authorities in Jacksonville, and the following is the reply:

JACKSONVILLE, FLORIDA, September 7th, 1888.

Thanks for information furnished. Will wire places you name for number they can accommodate. As we understand it, the State Board of Health of your State will not impose any obstacles on our people going to such places in your State as offered to receive them. Is this correct? Answer.

P. McQUADE, *Acting President.*

Such restrictions as were enjoined upon the Hendersonville Board of Health were communicated to Mr. McQuade.

The following is a letter of instruction to Dr. J. F. Abernathy, Superintendent of Health of Cherokee county, with his reply. (This letter was in substance what was written to each town offering to take refugees into their hospitable borders.)

NORTH CAROLINA BOARD OF HEALTH,
SECRETARY'S OFFICE,
WILMINGTON, September 7th, 1888.

DR. J. F. ABERNATHY, *Supt. of Health, Cherokee Co.:*

DEAR DOCTOR:—I understand that Murphy is willing to receive one hundred people from Jacksonville, Fla., refugees from the yellow fever. Please state fully how they will be cared for, and what restrictions will be imposed upon them. You are aware that by the terms of the law, you must state the restrictions to be imposed upon them, and that you act by advice of the County Board of Health. Please summon the Board of Health, and determine upon rules and send me particulars. I would insist that all who take refuge in your country shall be paroled not to go to towns that have not extended a welcome, and use what watch you can to prevent it. Telegraph at expense of State Board of Health, when necessary.

Yours, very truly,

THOMAS F. WOOD.

What altitude is Murphy above sea?

MURPHY, N. C., Sept. 10th, 1888.

DR. THOS. F. WOOD:

Dear Sir:—Your letter before me seems to be one of inquiry—to know what manner of comforts we can give the Jacksonville refugees, and what precautionary measures had or would be made for the people's protection?

1st. We can give them good second-class hotel fare, good, comfortable beds, good diet, and all the fresh air and pure water they or any one else could desire. Any more than one hundred refugees would have trouble to find a lodging place, owing to the immense influx from other States, and there is no good reason to think that our hotels and boarding houses will be vacated of their transient boarders before late autumn. Nevertheless, if more were to come than we could accommodate as we wish to, we would not in any way cast them off.

2d. I have consulted from time to time with the Board of Health, and what I have done has been sanctioned by the Board. I have the best authority to believe that we run no considerable risk. The Board of Health will meet them at the train and exchange all the passengers, and any one who, in the opinion of the Board, is suspicious or unsafe, will be isolated immediately.

The altitude of Murphy is 1,634 feet, although we can ascend to a greater height in half a mile of Murphy. Thermometer shows 66° in open air. Nights very cool; days pleasant.

J. F. ABERNATHY,
Co. Supt. of Health.

Some entirely new questions arose during the past summer, as partially related in above correspondence, as to the proper disposition to make of persons taking refuge in our State from Jacksonville, Florida. The depopulation of the last named city being decided upon, the next anxious question was, what towns will receive them? Extensive correspondence and telegraphing finally revealed the fact, that the towns of Murphy, Hendersonville, and several others were willing to allow these refugees to take up their abode in their midst.

The question naturally arose, who had authority to permit this colonization of persons from a pestilence stricken district. The only section of our law bearing upon this point was that found in Section 9 of the law relating to the public health, which is as follows:

SEC. 9. Inland quarantine shall be under the control of the County Superintendent of Health, who, acting by the advice of the local board, shall see that diseases dangerous to the public health, viz: small-pox, scarlet fever, yellow fever and cholera, shall be properly quarantined or isolated, at the expense of the city, or town, or county in which they occur. Any person violating the rules promulgated on this subject

shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined or imprisoned at the discretion of the court. In case the offender be stricken with disease for which he is quarantinable, he will be subject to the penalty on recovery, unless in the opinion of the superintendent it should be omitted. Quarantine of ports shall not be interfered with, but the officers of the local and State Boards shall render all the aid in their power to quarantine officers in the discharge of their duties, upon the request of the latter.

It was ascertained that Dr. L. L. Johnson, the Superintendent of Health of Henderson county, after consultation with the Henderson Board of Health, signified his willingness to allow the refugees to make their homes in the town of Hendersonville. Accordingly, on the -- day of September a train containing 260 persons were landed in the town, under the care of Surgeon Guiteras, of the Marine Hospital Service, and they were at once distributed and cared for. It is very remarkable to record that no cases occurred after they arrived in Hendersonville, and although ten were sick, only two died; thus justifying the confidence the County Board of Health had in the salubriousness of their climate and the entire safety of the citizens in assuming such an apparent risk.

Hendersonville is a town of 1,500 inhabitants, situate in a mountainous region, 2,252 feet above the sea level. The drainage of the town is considered good, but there is no sewerage or public water supply. Every year the visitors, who are seeking health and recreation, amount to as many as 600 at one time, and for four months of 1888, from 2,000 to 3,000. The town has an extensive reputation for salubrity, and on this account is growing in importance year by year.

The courage and good faith of the people in rendering service to the afflicted was manifested in the fact that eight families took numbers of them into their own homes, varying in numbers from three upwards. The largest number collected in one house was fifty, the smallest three. Doubtless the kindness of the citizens of Hendersonville will long be cherished, and probably the Board of Health would be willing to extend an invitation under like conditions in the future. This, like all questions concerning the public health, involves the greatest good to all, and must be considered solely by this standard. It is well enough for a town, elevated 2,252 feet, to think themselves secure, but while enjoying this security, the danger to their neighbors must be duly considered.

In this case, consultation by telegraph was kept up for several days, and the lack of proper preparation, after the refugees were received, caused considerable uneasiness in Charleston and Wilmington, so that these cities quarantined against Hendersonville. This precaution was none too soon, as two of the refugees came to Wilmington seeking admission and were properly turned away. The practical experiment opened up the true gravity of admitting these refugees to any part of the State, and the Board of Health decided to discountenance any further admission of them into the State, without they were properly cared for in a hospital camp, under sufficient guard, and in this opinion Gov. Scales promptly acquiesced, and the authorities in Florida and towns desiring to offer hospitality were duly notified.

In view of this experience, the question may be properly asked, what additional safeguards should be inaugurated to prevent a similar risk in the future? The State Board makes this suggestion: That no colonization should be permitted of persons from a pestilence stricken district, except upon express permission of the State Board of Health and the approval of the Governor, and only then when the money for maintaining such a camp is guaranteed by responsible parties immediately interested; and further, that strict rules and regulations should be specified and established by the State Board, controlling the movement of all persons connected with such camp. Our humanity may prompt us to offer succor to distress, but it should not betray us into any action which will endanger other communities.

From the course of the epidemic in Florida during the spring, summer and fall of 1888, there are grave apprehensions that we will have a repetition of the same serious state of things the next year, and prompt means should be taken to enable the Board of Health to put into execution a reasonable quarantine for 1889.

MARITIME QUARANTINE.

The dangers of the importation of pestilential diseases through our seaport towns is increasing yearly with the increase of railroads piercing the interior of our State. Especially is this true as regards Wilmington. The quarantine law governing the latter port is as good as could be desired, but the means at the disposal of the Quarantine Board are limited.

It will be remembered, that Southport at the mouth of the Cape Fear River, the entrepot of Wilmington, is located in a land-locked bay, 25 miles from that city. The roads on either side of the river are so bad that it practically bars the escape of persons detained at quarantine, and the river is easily guarded. The roadstead at the quarantine station is good, and large vessels can load and unload at this point. There could hardly be a better location for a hospital or for the establishment of a disinfecting station. The defects are, there is no hospital, and there is no wharf at which vessels could be moored to prevent upsetting when emptied of the cargoes for disinfection. An appropriation for this purpose is a commercial necessity, to prevent the prolonged detention of vessels. For many years the quarantine service of this port has been so well managed, that no cases of pestilential disease have been admitted into Wilmington, but the State should see that her chief port is not hampered by a management, which, for lack of modern outfit for properly disinfecting vessels and isolating persons, is sometimes a hardship to vessel owners. The Board of Health of Wilmington have always acted in harmony with the Quarantine Board, and they see the necessity of some action by the next General Assembly in appropriating money for a new and improved outfit.

The following correspondence from Dr. W. G. Curtis, who for years has acted so acceptably as quarantine officer at Southport, we give in this connection:

QUARANTINE STATION,
SOUTHPORT, November 16th, 1888.

DR. THOS. F. WOOD, *Secretary State Board of Health:*

DEAR SIR:—By section 2876, chapter 24, of The Code of North Carolina, it is provided, among other things, that the State Board of Health "shall direct the attention of the State to such sanitary matters as in their judgment affect the industry, prosperity, health and lives of the citizens of the State."

North Carolina possesses a salubrious climate, and her natural advantages for healthfulness are unexcelled by any State in the Union. But there is always a possibility of danger from without, and during the past season, there has been a probability of danger so imminent as seriously to alarm our citizens. Commerce brings us in intimate relations with all the world, and with many places where pestilence walketh by noonday and seeks and spares not the most healthful localities. The avenues of approach are many, and with increasing commerce, and increasing prosperity, dangers accumulate and the avenues have to be more strictly guarded.

The principal avenue by which dangerous diseases may approach our citizens is the Cape Fear River. It may be said, I think, without fear of contradiction, that if the quarantine service at the mouth of this great river were relaxed or discontinued, there would follow constant invasions of pestilential diseases, and prosperity would cease. The productions of North Carolina would seek other outlets. Our citizens would not expose themselves to dangers arising from pestilence. They would have no confidence in our merchants, and would rightly think that such carelessness must extend to all business transactions. The importance of the port of Wilmington would dwindle into insignificance, and the quotations of her markets would cease to be reported.

The quarantine service, therefore, ought to be perfected in every way known to science. It ought to be a popular service, looked up to by our people with confidence, and supported by liberal appropriations, when necessary. The present cost of this service is in the vicinity of one mill per head of the population—an amount so small that no one of that population has ever yet found out that he has paid it. The cost of one outbreak of yellow fever in Wilmington would be estimated as cheap at twenty million of dollars to the citizens of North Carolina. The cost of an idle rumor on the streets of that city, cannot, of course be estimated in money; but it is considerable and certainly amounts to a day or two of great discomfort for several thousand people.

It seems, then, that it would be wise policy to spend a little money for the perfection of this valuable service. But little is needed or asked for. At the last session of the General Assembly a bill was introduced appropriating seven thousand dollars for rebuilding the hospital and the construction of a wharf. The bill was so drawn as to provide fully and permanently for the service, and only in the event of Wilmington becoming a city of fifty thousand or more of population, was it expected that any further appropriation would be asked for. The design was, that for and in consideration of an appropriation of seven thousand dollars, and a yearly tax of about one mill per head of the population, North Carolina should have a permanent and self-supporting quarantine establishment, for the protection of her citizens from all such diseases as are brought to us in ship; that is to say, from cholera, ship fever, yellow fever, and incidentally from small pox, though it is to be supposed that an enlightened people will protect themselves from the latter disease by vaccination. This seems a sufficiently small sum with which to purchase such benefits. I suppose there might be found within the limits of North Carolina many hundreds of people who would cheerfully pay that amount out of their private purses, rather than have either of those malignant diseases invade their families. There are many thousands who would gladly pay that amount and more, if they had it, to secure immunity,—so dreadful are these diseases, and so fatal, seeking out, it almost seems, the best, the bravest and the most honored among the people.

And what do the poor think about these things? and the vast majority who cannot fly from pestilence, but must stand and face it? What should they think, but that they have wise and humane legislators, who will interpose all the protection and relief that may be put in the provisions of law for such benificent purposes made and provided?

The quarantine laws of North Carolina are ample, and no particular revision is suggested. But section 2915 of chapter 24 of The Code provides, that a hospital shall be established. It seems, therefore, obligatory upon the General Assembly to provide the means for building such a hospital; but waiving that question of law for the present, I will endeavor to show the necessity of such an establishment, if we wish to preserve a reputation for humanity, and build up prosperous cities.

An example, which may occur at any day in the year, seems best adapted as an argument to show what ought to be done.

An infected ship comes to the Quarantine anchorage. There is yellow fever on board, and the sick and well are confined together within the small compass of the ship's quarters. The sick, if not past thinking, expect to die. There is terror among those not yet stricken down. The news travels fast, and dread settles like a pall over the vicinity. What is to be done for their relief—and how shall the germs of infection be destroyed? Shall those as yet not infected be compelled to remain on board to sicken and die in their turn? Must the germs of disease lie festering and accumulating in forecastle and cabins, a constantly increasing focus of danger to the community? Shall this ship be forced to lie at her anchorage for month after month, rotting and wasting, and being consumed by expenses which will never cease until she is a total loss to her owners?

Is it necessary that this great channel of commercial activity—this natural outlet for the cotton, the naval stores, the timber—the future coaling station of the South Atlantic, and nearest point of shipment for the great West—should have to acquire so evil a reputation throughout the world that ships would not come here on the same terms offered by neighboring cities of the Southern coast?

To all these questions, it must be answered that, at present, there is no remedy. Given the infected ship, and the evils described, will happen, and perhaps worse, for it will be difficult, if not impossible, in a period of prolonged detention, to keep the disease from invading the neighboring shores.

What, then, is to be done? The answer is simple, and I call upon the State Board of Health to assist the Quarantine Board in bringing this matter before the next session of the General Assembly, to the end that a hospital may be built, and thereby the evils described be averted.

Then, when the infected ship arrives, we will take out the sick and cure them, if we can, in a comfortable hospital—if they are unfortunately beyond our skill, and die, we will bury them in the hospital cemetery like Christians, instead of digging a hole in the nearest beach, from which they will be washed out by the first storm to the terror of passers by. We will take out the well also, and place them under observation in another and isolated building. We will then proceed without delay to remove ballast and everything capable of carrying infection, and disinfect the ship.

After this is done, and the period of incubation has passed, we will take all the surviving crew and put them on board again and set them on their way rejoicing, as they must do after escaping so great perils.

And for all these services, the owners will not only gladly pay the bills, but thank the State of North Carolina for the beneficent laws that have insured such humane treatment.

This argument treats mostly upon the propriety of an appropriation for the purpose of carrying out existing law, and building a hospital, from a sanitary point of view; but its commercial and economic aspect is equally forcible in procuring the desired legislation. The port of Wilmington, which includes all of the Cape Fear River as far as its navigable water extends, is of growing importance, and the attention of the world is being attracted to its improving bar, and the extensive and valuable harbor facilities contained within it. Wilmington is connected with a large portion of North Carolina by means of railroads already built. Merchants, wielding a vast capital, have established themselves, and are ready, and offer facilities for the transaction of all the business which comes to the wharves and warehouses they have constructed.

Not only the merchants, but their customers throughout North and South Carolina desire, and are entitled to have, the protection of the most enlightened sanitary laws. Railroad connections with the interior are constantly enlarging the limits of the trade, which aims to take in the markets of the world. A great trunk line is projected from the mouth of the Cape Fear at Southport, in a straight line, and by the easiest grades to Bristol, Tenn., and thence with all the great cities of the West. This line of construction will connect by the shortest and cheapest route one-half of the State of North Carolina with the mouth of the Cape Fear River. There will be largely increased commerce with West India and South American ports. There will be more danger, but wise legislation will provide the facilities for meeting it. What is wanted is a good sanitary record for the Cape Fear. A vigilant quarantine, with proper facilities for the treatment of all cases which may arise, with quick despatch, after its requirements have been obeyed, will give a good reputation to the port, and insure the confidence of our citizens.

Very respectfully, your obedient servant,

W. G. CURTIS,
Quarantine Physician, Port of Wilmington.

HYGIENIC TEACHING IN PUBLIC SCHOOLS.

The school term in most of the counties is so short that in those counties where the term is longest there is little time available for the systematic study of the elements of hygienics. If there was time, there are not many books available for school children and which would be economically placed in their hands. The Board of Health, in view of these facts, have endeavored to bring the study of hygienics to the attention of the teachers, believing that if the Superintendent of Public Instruction and the Teachers' Assembly could be brought into communication with the State Board of Health, that much that was of common interest could be inaugurated which would be of advantage to all concerned. To this end, Drs. Jones and Lewis were sent as representatives to the Teachers' Assembly, and the interview and interchange of ideas in reference to the instruction in hygienics to pupils was a satisfactory beginning.

The Board selected a work of much value for distribution among the teachers, viz: The Lomb Prize Essays on the following subjects:

"*Healthy Homes and Foods for the Working Classes*";

"*The Sanitary Conditions and Necessities of School Houses and School Life*";

"*Disinfection and Individual Prophylaxis Against Infectious Diseases*";

"*The Preventable Causes of Disease, Injury and Death in American Manufactories and Work-shops, and the best means and Appliances for preventing and Avoiding them.*"

The above essays are contributions for which a prize of $1,100 was paid by the philanthropist, Mr. Henry Lomb, of Rochester, New York, and embrace many of the elements of hygiene, as applied to the every day affairs of life. It is by such instruction as they contain that teachers can fit themselves to instruct children. As before noted, the teacher can give little or no time to text-book teaching of hygienics, and must content himself with giving oral lessons, as occasion permits, during the session. Every teacher of experience can find opportunities to inculcate lessons orally and practically on the more essential topics which appertain to healthy lives and healthy homes, and if he masters the fundamentals himself, and seeks the opportunity to teach them, he can give a more correct impression to his scholars than crude text-books interlarded with the "horrid-example" lessons.

As our efforts, so far, have been well received, the Board desires to cultivate more intimate relations with the teachers of the State, and co-operate with them in promoting a knowledge of hygienics.

OF THE ORGANIZATION OF COUNTY BOARDS OF HEALTH.

In January, 1887, there were fifty-one counties having organized Boards of Health, which, as compared with the beginning of 1886, is an increase of eleven having such organization. The functions of these boards have been of increasing importance during this period, and at the end of 1888, there are fifty-four. The organization of these county boards is regarded as of prime importance for the following reasons:

Every county has to incur an expense in medical services to the prisoners in jail and house of correction, and to the inmates of the poor-house; further, a physician must be employed for coroner's inquests, and in time of extra emergency, to take charge of cases of pestilential disease. These are unavoidable expenses, but after all they leave many items out of account, the more important of which are the sanitary care of the public institutions. The above services, too, being probably divided among several physicians, there is not anything like a continuous sanitary service practicable. The law organizes these duties under the charge of one responsible officer, the Superintendent of Health, and makes him responsible for the sanitary inspection of all the establishments which the County Commissioners have under their care. The inspection done by the grand jurors, quarterly, is only a small opportunity of correcting insanitary evils that may exist, for, as we have pointed out in our previous reports, the county functionaries have due warning of the day of inspection by the grand jury, and the appearances exhibited are not to be taken as criteria of the state of things for the rest of the year. Under the eye of the Superintendent of Health, there is far more probability of thorough inspection, and this officer, by terms of the law being a physician selected for the purpose, his knowledge of sanitation must exceed that of the average jury, and be more effectual than the employment of various physicians.

The terms of the law seem mandatory enough. (Sec. 5), "*There shall be* an auxiliary board of health in each county of the State," not leaving it to the opinion or preferences of county officials whether or not these boards shall be organized. This organization, where it has been effected, has elicited a growing feeling of confidence, and surely those counties having such an organization, are laying valuable foundation against the probable evils of invasion by pestilential disease. No county is so remote now that it may not, in a few years, be put in communication with the current of restless travel by the construction of railroads, and to meet these demands of an exacting civilization, organization must be begun.

Organization has another important merit; it enables counties to study their own condition as to the prevalence of diseases, death rates, causes of sickness, and also to build up records upon which to found a definite opinion of the favorable progress or decline of the sanitary condition of the people. This has now a practical bearing and will have in the future much more, as the tide of population turns towards our State seeking homes, these records must be forthcoming, figures of climate record, death rate, sickness rate, bearing official authority will be sought after by such seekers. It is in vain that we speak in glowing terms of our healthfulness and appeal to the oldest inhabitant for the salubrity of the climate, if we have nothing more definite to show strangers. We know our advantages, but they remain to be convinced.

PENITENTIARY CONVICTS.

During the year reports had been made monthly to the

President of this Board by Dr. James W. McGee, physician to the Penitentiary, and such suggestions from time to time are made as seem to be indicated. The Board of Health has worked harmoniously with the authorities in this matter, and we trust, with advantage to the State.

INSANE ASYLUM.

During the year a committee visited the Western Insane Asylum at the request of the Board of Directors of that Institution, and their report is on file. An invitation has been extended the Board to visit the Eastern Asylum for the Insane at Goldsboro.

For the first time in the history of the Board, the management of all the public institutions have shown their appreciation of the work of the Board of Health, and have asked their inspections and counsels based thereon.

IMPROVEMENT IN COUNTY PUBLIC BUILDINGS.

Since the beginning of the publication of the "Bulletin," (1886) the most noteworthy fact has been the improvement in the condition of jails and poor-houses. We have endeavored to get such inspections and secure such reports as would give the public proper information about the condition of prisoners and wards of the counties. This has been the burden of our endeavors from the inauguration of the Board, and, while we do not claim that all of these improvements have been brought about by the efforts of the Board, we are satisfied that what has been done has reached the ear and consciences of the public in a proper way, and that much of this fruitful result is due to our endeavor.

EXECUTIVE POWER OUGHT TO BE BESTOWED UPON THE BOARD IN CERTAIN CASES.

The attitude of the State and County Boards of Health is advisory. In all the work done by either, these bodies must wait to be consulted by county or State authorities or give advice gratuitously. In the latter case the Boards have been obliged to depend upon the force of public opinion to reach the constituted authorities, or, if the public feeling were apathetic, see such advice meet the fate of all gratuitous advice—rejected and contemned. Some little executive power can sometimes be exerted when the Superintendent of Health works in concert with municipal authority, in enforcing health ordinances already framed by towns and cities, but this is only secondary, and the judgment of an educated Superintendent of Health can be disregarded or opposed by a municipal officer and place the Board of Health in the attitude of indifference. There are certain conditions where the Board of Health should be clothed with executive power, and these conditions should be carefully studied and incorporated in a bill to be presented to the Legislature, after having been carefully put in legal shape by a good lawyer. There are times when the authority of the Board of Health of counties should be supreme. There are times of public danger when none can be found at their posts but the few sentinels, too humble, when the security of health reigns, to be clothed with authority, but too valuable to be treated with indifference—men who are not afraid "for the pestilence that walketh in darkness, nor for the destruction that wasteth at noonday."

VITAL STATISTICS.

A system of the registration of births, deaths and marriages, including also the numerical details of the occurrence of diseases dangerous to the public health, will be a necessity of the near future. It is not only expensive work, but in order to be accurate, must be conducted by those who have mastered the details of the work, as well as the underlying principles. It may be that the people are not ready yet to establish the work, and it may be as well, until the State can secure the services of trained officials. The demand of the times is steadily in this direction. The restless population of this great country is turning here and there for unoccupied lands upon which to establish homes, and they seek information upon the subject of prevalence of disease which has the authority of organized and authorized registration.

THE BULLETIN OF THE NORTH CAROLINA BOARD OF HEALTH

Was begun in 1886, April, and has continued its monthly visitations ever since. It is distributed to State and county officials, to Superintendents of Health, and to any person asking for it. Its objects are several:

1st. To put on record the condition of health, the prevailing diseases among the people and the domesticated animals in all parts of the State, serving as a means of intercommunication by which counties can compare their conditions of sickness with each other.

2d. To give the numbers of paupers and prisoners in each county, and to show their sanitary condition and surroundings, and also their educational condition, as far as their ability to read and write.

3d. To give the numbers of deaths, and the principal causes of death, in the larger towns in the State.

4th. To give the record of temperature and the barometer from principal divisions of the State.

The Board considers this pioneer work, from which they hope to educate the people up to the necessity of accurate, vital statistics. Accuracy cannot be expected as the county boards are organized, as the Superintendent of Health cannot require the physicians in the county to report to him—their aid being voluntary, it is generally uncertain. The only report he is able to make is such as he, by diligent inquiry, can collect, and hence must be stated only in general terms.

The time has come when all the towns in the State, numbering 500 or more, should make a record of deaths and births. The reports now sent in from 12 to 14 towns is voluntary, but mostly accurately founded upon the record obtained by compulsory certificate of death. It is to be hoped that the General Assembly will give us a law requiring such record to be kept.

The following suggestions are offered:

1st. No person should be allowed to be buried in any public or private burial ground without the certificate of a regular physician, or an affidavit of the reason why it is not possible to get a physician's certificate, and this affidavit must be acceptable to the Superintendent of Health of the county.

2d. These certificates should be sent to the County Superintendent of Health, and by him registered in a book to be furnished by the State Board of Health.

3d. A failure to secure a certificate of death which is satisfactory, should render the necessity of a coroner's inquest.

4th. All infants born should be reported within a week of their birth to the County Superintendent of Health, under a sufficient penalty for failure to report. The duty of reporting might devolve upon the nurse or physician. A record of the births should also be kept by the County Superintendent of Health and be by him reported as usual to the Secretary of the State Board.

NOTIFICATION OF PESTILENTIAL DISEASES.

It is desirable that a law should be enacted to compel physicians and householders to report small-pox, diphtheria, scarlet fever, yellow fever; measles, cholera, or other diseases which are known to be capable of multiplying and threatening the public health.

There are some good reasons: The concealment of most of these diseases makes it possible for unwary or curious people to rush into danger; also concealment usually means confinement in close quarters which is detrimental to nearly every disease of this character

Isolation of such cases and cautionary guarding offers the best means of defense for the community.

The only way to get help from the State Board of Health and from the contingent fund held subject to the order of the Governor, is prompt notification of the facts to the Secretary of the State Board.

The concealment or misrepresentation of dangerous or pestilential diseases has been the prolific source of their spread, and it should be classed with the criminal offences against the State.

GARBAGE DESTRUCTION BY BURNING.

One of the questions involving the cleanliness and health of our towns is the disposal of garbage. Garbage includes all the dry trash and cast-off household articles, the refuse of the kitchen, the contents of privy sinks. The old and slovenly ways which have been in vogue for years consisted in casting the dry garbage to the waste land in the suburbs of towns, or to fill up gulleys and wet places with it, thus sowing seed for future repentance. The night soil was, and is carried to a short distance from habitations and deposited in shallow trenches. Slovenliness has been the characteristic of this disposition of the refuse of towns and disease and noisome odors have marked the places of these deposits. Various plans have been attempted by some of the more careful and prosperous towns, but none have been entirely satisfactory.

We have at last come to a period in sanitary history when the attempt is being made to destroy garbage by burning. Several years ago this Board published a pamphlet showing the necessity and possibility of garbage disposal by burning, illustrating it with one of the furnaces erected at the time. Many points of failure marked the earlier apparatus, but the development has been gradually growing forward to a stage of comparative success.

At the last meeting of the American Public Health Association, one of the prominent subjects was the cremation of garbage. The announcement of the topic brought together the inventors of the furnace, with their apparatus for exhibition, and a number of sanitarians from the chief cities and towns in the United States and Canada. Practical exemplifications of the working of the crematories, and a full description of the development of the process of cremation of garbage from the earliest inception of the process, were brought before the Association. The North Carolina Board had representatives to witness these processes in the persons of Dr. H. T. Bahnson, of Salem, and Dr. Thomas F. Wood, of Wilmington.

We will give a description of these crematories, giving only those which appear to us to have present practical value, beginning with the Engle cremator, one of which is in working order in Des Moines, and another recently erected in Milwaukee.

On our way to Milwaukee we stopped at Chicago, and through the courtesy of Dr. DeWolfe, the able health officer of that city, we saw in operation the garbage furnace erected in the outskirts. The garbage is brought from all parts of the city, and landed upon a platform above the furnace, it being erected in the bed of a stone-quarry, and the garbage is dumped into shutes, which land it at the furnace doors. This garbage consists of everything usual to the refuse of a large city, except night soil. An examination of the process showed that it was only partially successful, as the smoke was not burnt up, and the chimney emitted bad odors, which would bring loud complaints in a population denser than where this was located.

The desiderata, though, in regard to the destruction of garbage, are its complete reduction to harmless residue, and the avoidance of the noxious odors in the process. This the Engel furnace accomplishes.

By reference to the cut, it will be seen that the forward end is towards the left. "The upper door shown in the left hand end opens into the fireplace, and the door immediately below opens into the ash pit thereunder. The five larger openings shown on the side of the furnace midway of its length, open into the ash pit under the grate, which supports the garbage and other wet and offensive substances which are being burned. Five smaller doors above open into the garbage fireplace in order to give easy access thereto in case it becomes expedient to stir or otherwise move the garbage in the fireplace while being consumed. There are also openings in the rear fireplace, and into the pit under it. Three angular valve handles operate the three valves which appear in the figure to the left of the rear fireplace. The two valves which appear in the figure give egress into the chimney from the first fireplace and the second fireplace respectively. The three covers on the top of the furnace close the downward openings in the top furnace, through which the matter may be dumped upon the grate. (See figure 2.)

Figure 1 gives the perspective elevation of the furnace. (See figure 1.)

From what we could gather, several of the best patterns of these crematories were about to be consolidated into one improved furnace, which would probably fulfill the demands of the service required, and that it would be a fair estimate to make that a furnace large enough to consume the garbage of a town of 20,000, probably including the night soil, could be built for $3,000. The expense of operating would depend on the cost of fuel.

Another form of the garbage crematories is a domestic one, which is adopted for the burning of the refuse of the household, including chamber lye. It is being adopted in some cities with a good deal of satisfaction, and by experimental demonstration we can say that it is worthy of extensive trial.

The mode of operation is as follows: The garbage and matter to be consumed are dumped upon the garbage-grate, and a fire of coal is made in each of the two fireplaces at the respective ends of the furnace. The flames from the rear fireplace pass over the garbage, driving before them the steam and other gases arising therefrom into the flames above the forward fireplace, where the flames from the two furnaces meet and mingle. As those mingled flames pass backward toward the chimney, they intensely heat the iron floor of the garbage ash-pit, and that floor conducts heat upward toward the garbage above it, and thus aids in volatilizing the liquid constituents thereof. This operation continues until the substances on the garbage-grate are reduced to a dried condition, when the lower chimney-valve may be closed and the upper chimney-valve opened; and thereupon the flames will pass from the forward fireplace above the garbage-grate, and ignite the dried substances resting thereon, and drive the products of the resulting combustion into and through the flames above the rear fireplace.

The question of economy, so far as the best use of the refuse of cities is concerned, is not considered in the Engle crematory described above, but only that economy which puts refuse matter into a harmless condition. For small towns this question is not an urgent one, the number of dead animals to be burned not being great enough to make it worth while to separate the fat, hides, hoofs, &c., but in the larger cities it is a question which will be settled, as it has been in a crematory erected at Buffalo.

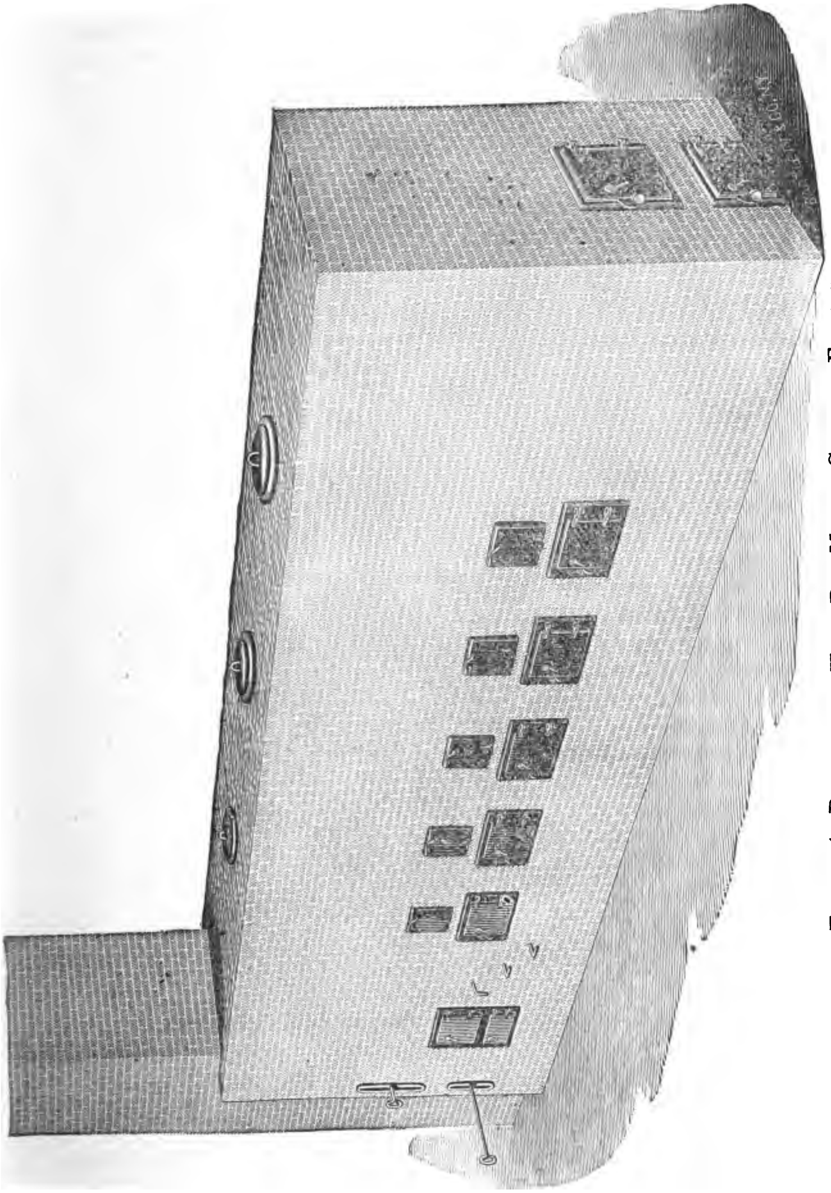

FIGURE 1—PERSPECTIVE VIEW DES MOINES GARBAGE FURNACE.

The following description of the crematory erected at Buffalo, New York, known as the Vienna Garbage Process, I take from the *Sanitary News*, of 25th December:

> It consists of a large cylinder or boiler, called the dryer. This is inside a larger body of the same shape, leaving a large opening between the two boilers. When the inner cylinder is filled with garbage, the cap is put on the man-hole of the outer one, and steam at 250° Fahrenheit is turned on in the open space. The garbage is submitted to the cooking process for six or eight hours. The vapor generated by the heat, and acting upon the liquid portion of the stuff, is forced out and into a column still containing perforated plates and filled with cold water. The condensation is rapid, and it passes away from the discharge-pipe in the shape of cool and entirely colorless water, having the odor of water in which vegetables had been boiled. The garbage is carried by elevators from the dryers to the floor above, where it is dumped into vats, called extractors. When filled, the vats are covered with iron plates; and benzine and other chemicals are turned into it from another vat. This and the steam heat, which is again turned on, separates the oil and grease from the garbage, the former being drawn off at the bottom of the vat. It resembles crude petroleum, and has little or no odor. The garbage is then taken from the vats and conveyed to another dry-room with thin iron plate floor. By this time the substance is reduced to about the consistency of ground tan-bark, and is odorless. It then meets with a ready sale to fertilizers. The furnace has a capacity of forty-five tons of garbage per day. The inside of the crematory is not at all offensive, and there is no unpleasantness about it.

What concerns us most, can we erect these furnaces at small enough cost to make them available for small towns, where economy is a paramount object? do these furnaces really destroy without offensive exhalation? We believe the answer to both questions can be given in the affirmative.

THE SLAUGHTERING OF ANIMALS FOR FOOD.

There is not in the State any law, either general or local, which gives to the consumer any security that the animal food offered in our markets is in proper condition, and there is no greater danger in communicating some forms of disease than by ill-conditioned meat. The description of the

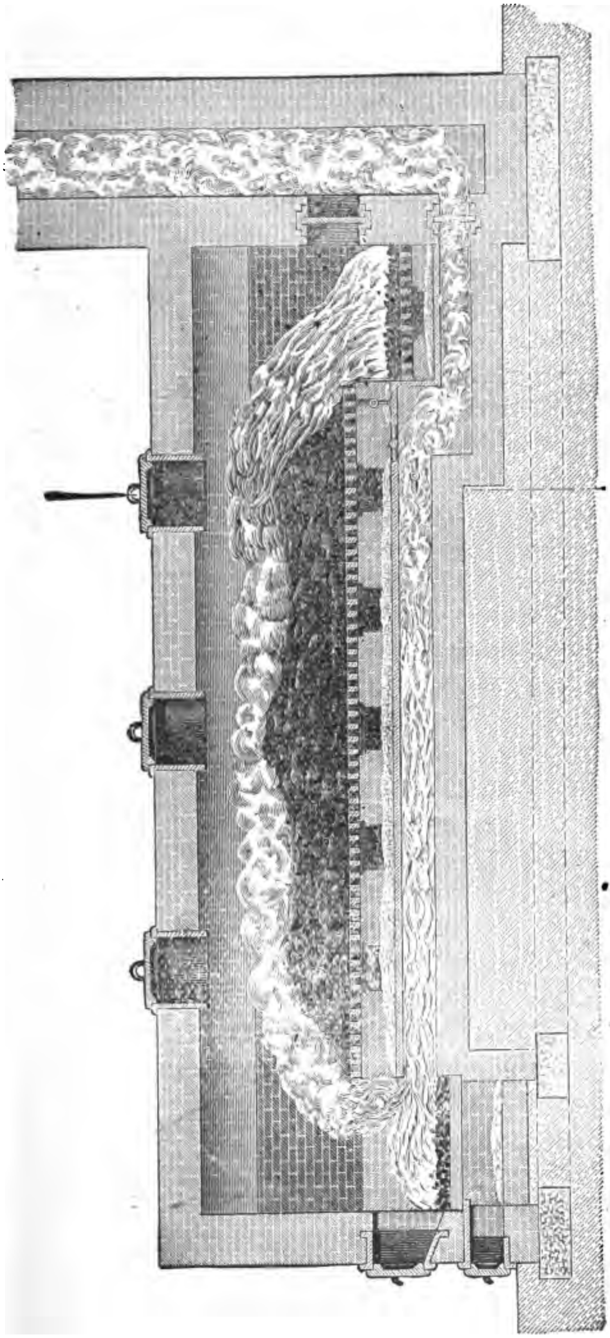

FIGURE 2—VERTICAL LONGITUDINAL SECTION DES MOINES GARBAGE FURNACE.—Position reversed from Figure 1.)

usual processes of slaughter and preparation done in some of our towns would disgust most persons with the beef and mutton they eat, and pork would have to be rejected as absolutely repulsive. Provisions against such abuses would be forced by the public, if it were the fashion of our newspaper men to "write up" the condition of our slaughter houses with the same disregard of private rights as is shown in some sections of our country. Our people do not know what the abuses are, and what are the dangers to health, but at no distant day this matter must have serious attention.

The dangers are all the more apparent, when we examine the record of the counties in which there exists hog cholera and chicken cholera, both diseases, perhaps, incorrectly named, still meaning fatal pestilential diseases. The eating of the meat of such animals, although fortunately largely purified by cooking, can but be disgusting, and most likely harmful. Poultry is marketed in crowded coops, so many of the chickens dying as to create the suspicion that they are marketed to get rid of them before they die on the producer's hands

The protection of the people against such abuses is the province of the State, and the State Board asks that the General Assembly inquire into the best means of bringing it about. Model abbattoirs can be seen now in all parts of the country, where food animals are cared for, slaughtered economically and cleanlily, to the decided advantage of the consumer as well as the dealer.

TREASURER'S REPORT.

1888.				
Jan'y	5	Balance on hand from 1887	$217 24	
	7	Subscription to "Sanitarian"		$ 28 00
	7	Express on "Bulletin"		50
	11	Postage on "Bulletin"		25
	24	Postage stamps		4 00
	26	"Little Gem" Stamp		2 00
Feb'y	1	Proceedings National Board of Health, Meyers Bros., Columbus, Ohio		3 50
	1	Express on above		1 50
	1	Postage on "Bulletin"		14
March	5	"Sanitary Engineering and Building Record" for Arthur Winslow		4 00
	13	"Climatologist" subscription, 9 copies		4 50
	14	"Sanitary Era" subscription, 9 copies		9 00
	31	"Lomb Prize Essays"		70 00
	31	Salary Secretary and Treasurer		300 00
April	2	"Health of Nations," P. Blakiston, Son & Co.		8 00
	4	Freight, 3 cases books, Concord, N. H.		3 11
	4	Drayage on above		20
	4	Express on "Bulletin"		50
	9	Telegram		50
	12	Express on wrappers from Philadelphia		1 10
	28	Express on wrappers from Philadelphia		75
	28	Geo. F. Lasher, bill for addressed wrappers		23 25
	19	Postage		27
May	4	C. W. Yates, bill stationery to Dr. John McDonald		11 40
	10	Express freight to Fayetteville		1 25
	10	Postage		25
	10	Expenses of Mr. J. L. Ludlow to Fayetteville meeting		23 70
	10	Expenses of Dr. Thos. F. Wood " "		27 80
	10	Expenses of Dr. H. T. Bahnson " "		27 40
	10	Expenses of Dr. Richard H. Lewis " "		20 35
	15	The "Sanitary News," 9 subscriptions		13 50
	15	Postage		1 00
	21	Dr. J. H. Tucker, expenses to Fayetteville meeting		33 50
	21	Postage stamps		1 00
	31	Postage stamps		1 00
	31	Postage on Bulletin		30
June	2	Wilmington Paper Co., bill for envelopes, pens, &c		12 60
	5	Postage stamps		1 00

June	7	Postage stamps	$ 1 00
	8	Telegram to Wilson Board of Health	82
	8	Expenses visit of D. Thos. F. Wood to Wilson as expert	13 35
	11	Telegram Dr. Benj. Lee, Philadelphia	43
	13	Express freight on box to Teachers' Assembly, Morehead City	2 75
	22	Bill of S. G. Hall, printing and stationery	13 00
	27	Dr. J. W. Jones, expenses to Teachers' Assembly, Morehead	21 75
	27	Dr. J. B. Lindsley, for volume 12 Transactions Am. P. H. Association	5 00
	27	Postage on "Bulletin"	25
	30	Salary Secretary and Treasurer, for 2d quarter 1888	300 00
	30	Expenses J. L. Ludlow, visit of inspection Eastern Insane Asylum	22 65
July	6	Express on "Bulletin"	50
	6	Expenses Dr. Rich'd H. Lewis to Teachers' Assembly, Morehead	20 65
	6	Postage and wrappers on "Care of the Eyes," mailed by Dr. Richard H. Lewis	50 00
	9	Postage	30
	15	Box rent, post office	1 50
	18	Expenses Dr. J. H. Tucker, visit inspection to Eastern Asylum for the Insane	19 00
	19	Stamps	1 00
	23	Bill Wilmington Paper Co., for stationery	4 50
	25	Postage	1 00
Aug.	7	Postage	25
	10	Express on "Bulletin"	50
	10	Bill of Branch & Lamb for microscope	84 00
Sept.	5–8	Telegrams to arrange for Jacksonville refugees	8 54
	8	Telegrams, as above	1 58
	17	Telegrams, as above	1 89
	17	Postage	50
	18	Telegrams	1 83
	30	Salary of Secretary and Treasurer, for 3d quarter 1888	300 00
	30	Express on "Bulletins"	50
Oct.	17	Expenses of Dr. W. J. Love as an expert to investigate the reported case of yellow fever near Burgaw	50 00
	19	Postage on Bulletin"	25
	19	Express on "Bulletin"	50
	22	Telegrams to Hendersonville	1 45
Nov.	6	P. Blakiston, Son & Co.'s bill	4 80
	10	Express on Pennsylvania Health Reports to members of Board	2 60

Nov.	10	Express on "Bulletin"		$ 50
	30	Expenses of Dr. H. T. Bahnson as delegate to the Am. Public Health Association at Milwaukee, Wis		105 00
	30	Expenses of Dr. Thos. F. Wood, as above		105 00
Dec.	17	Postage on "Bulletin"		39
	17	Express on "Bulletin"		50
	18	D. Appleton & Co.'s bill		3 75
	18	Stamps		1 25
	27	Postage on "Bulletin"		28
	31	Office rent, twelve months		60 00
	31	Salary for 4th quarter, Secretary and Treasurer		300 00
	31	Fuel		3 00
	31	Harper Bros.'s bill		6 00
	31	Am. Public Health Association		5 00
				$2,170 57
1888.				
Jan'y	5	Balance on hand from 1887	$ 217 24	
	5	Warrant, 1st quarter	500 00	
April	12	Warrant, 2d quarter	500 00	
Aug.	3	Warrant, 3d quarter	500 00	
Oct.	17	Warrant, 4th quarter	500 00	
			$2,217 24	
			2,170 57	
		Balance on hand	$ 46 67	

MORTUARY REPORT FROM NINE TOWNS FOR 1887.

	POPULATION.			JANUARY.					FEBRUARY.					MARCH					APRIL.				
				WHITE.		COL'D.			WHITE.		COL'D.			WHITE.		COL'D.			WHITE.		COL'D.		
	White.	Colored.	Total.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.
Wilmington...	8,000	13,000	21,000	11	16.5	29	26 8	22.9	4	6.0	19	19.0	13.8	10	1.5	25	25.0	21.0	13	15.8	30	26.6	22.1
Charlotte........	6,000	5,000	11,000	5	10.0	8	19.2	14.2	8	16.0	12	28 8	21.7	7	14.0	13	31 2	21.8	11	22.0	12	28 8	25 1
Asheville........	4,500	1,500	6,000	8	21.3	8	64 0	32.0	11	29.3	11	88.0	44 0	8	21.3	9	72.0	34.0	10	21.3	3	19 1	20.8
Fayetteville..	2,500	1,800	4,300	5	21 0	2	13 3	19.5	3	14.4	2	13.3	13 9	2	9.6	5	33.3	19.5	1	4 8	6	40.0	19.5
Raleigh..........	8,000	7,000	15,000	...	......	...	......	......	...	......	...	......	......	6	9.0	9	15.4	12.0	...	......	...	......	......
New Berne.....	3,000	4,000	7,000	...	......	...	......	......	...	......	...	......	......	2	......	8	......	......	2	8.0	13	39.0	25 8
Durham	3,500	2,500	6,000	...	......	...	......	......	...	......	...	......	......	...	......	...	......	......	...	......	...	......	......
Tarboro..........	1,300	1,200	2,500	...	......	...	......	......	...	......	...	......	......	...	......	...	......	......	...	......	...	......	......
Washington...	2,400	1,600	4,000	...	......	...	......	......	...	......	...	......	......	...	......	...	......	......	...	......	...	......	......

MORTUARY REPORT FROM NINE TOWNS FOR 1887.—(CONTINUED.)

	MAY.					JUNE.					JULY.					AUGUST.				
	WHITE.		COL'D,			WHITE.		COL'D.			WHITE,		COL'D.			WHITE.		COL'D.		
	No. of deaths.	Temporary annual death—rate per 1,000.	No. of deaths.	Temporary annual death—rate per 1,000.	Total temporary annual death—rate per 1,000.	No. of deaths.	Temporary annual death—rate per 1,000.	No. of deaths.	Temporary annual death—rate per 1,000.	Total temporary annual death—rate per 1,000.	No. of deaths.	Temporary annual death—rate per 1,000.	No. of deaths.	Temporary annual death—rate per 1,000.	Total temporary annual death—rate per 1,000.	No. of deaths.	Temporary annual death—rate per 1,000.	No. of deaths.	Temporary annual death—rate per 1,000.	Total temporary annual death—rate per 1,000.
Wilmington	7	8.5	23	20.4	15.4	12	14.5	21	18.7	17.0	15	18.2	26	23.1	21.0	9	11 0	27	24 0	18.5
Charlotte	16	32.0	15	36.0	33.8	19	38 0	19	45 6	41.5	8	16.0	10	24.0	19.6	5	10.0	14	33.6	20.7
Asheville	7	18.1	6	27.6	21.5	20	51.7	11	50.6	51.3	11	28.4	4	18 4	24 8	6	15.5	2	9.2	13.2
Fayetteville	2	9.6	4	26.4	16.8	3	14.4	4	30.0	19 5	1	4 8	3	20 0	11.2	6	28.8	5	33 3	30.7
Raleigh	...	......	...	......	......	...	......	...	......	......	18	27.0	17	29.1	28.0	13	19.5	14	24.0	21.6
New Berne	2	24 9	13	39.3	34.5	...	......	...	......	......	...	...	...	......	......	...	......	...	......	......
Durham	4	13.7	4	19.2	16 0	4	16.0	3	14.4	15.3	4	10.7	3	14.4	12.0	6	16.0	6	28.8	20.6
Tarboro	...	... ..	...	......	......	...	......	...	......	......	...	......	...	......	......	...	.....	...	......	......
Washington	...	......	...	.....	......	..	......	...	......	......	...	......	...	......	......	...	......	...	......	.....

MORTUARY REPORT FROM NINE TOWNS FOR 1887.—(CONTINUED.)

	SEPTEMBER.					OCTOBER.					NOVEMBER.					DECEMBER.						
	WHITE.		COL'D.			WHITE.		COL'D.			WHITE.		COL'D.			WHITE.		COL'D.				
	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death—rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death—rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death—rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death—rate per 1,000.	Total number of deaths during this year.	Total temporary annual death—rate per 1,000.
Wilmington	13	15.6	4	36.1	27.6	10	11.1	23	17.3	14.1	10	12.1	27	24.0	18.9	10	13.3	24	20.6	17.7	390	18.1
Charlotte	4	7.9	9	22.8	15.2	4	6.6	16	32.0	18.1	6	12.0	8	19.2	15.3	4	8.0	8	19.2	13.1	201	18.2
Asheville	9	28.1	5	22.8	22.9	8	17.2	7	26.8	20.7	8	20.6	2	9.20	[illegible]	13	33.6	6	27.6	31.4	193	20.1
Fayetteville	5	2.4	13	8.6	5.0	4	16.0	5	27.7	20.9	2	9.6	3	20.0	13.9	3	11.1	4	26.6	19.5	93	20.1
Raleigh	15	21.6	22	37.2	28.8	18	22.5	16	22.8	22.0	18	21.0	14	24.0	24.2	5	7.5	14	24.0	15.1	196	13.0
New Berne	...	......	...	......	......	...	......	...	......	......	3	18.0	10	24.0	[illegible]	5	30.0	9	36.0	33.6	86	12.2
Durham	5	13.2	4	19.2	14.4	7	15.5	4	16.0	13.7	6	16.0	4	19.2	17.1	2	5.3	4	16.0	9.6	72	12.0
Tarboro	...	......	...	......	......	...	......	...	......	......	1	9.2	3	30.0	19.2	1	9.8	1	10.0	9.6	6	1.1
Washington	...	......	...	......	......	...	......	...	......	......	...	......	...	......	......	1	5.0	2	15.0	9.0	3	9.7

MORTUARY REPORT FROM FIFTEEN TOWNS FOR 1888.

	POPULATION.			JANUARY.					FEBRUARY.					MARCH.					APRIL.				
				WHITE.		COL'D.			WHITE.		COL'D			WHITE.		COL'D.			WHITE.		COL'D.		
	White.	Colored.	Total.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths,	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.
Asheville........	4,500	1,500	6,000	28	67.2	13	52.0	61.5	8	19.2	7	28.0	22 5	18	43.2	11	44.0	43.5	5	12.0	4	16.0	13.5
Charlotte........	6,000	5,000	11,000	3	6.0	11	26.4	15.3	4	8.0	16	38.4	21.8	...	.....	...	.....	....	...	.....	...	.....	....
Durham	3,500	2,500	6,000	7	21.0	5	17.1	19.2		18.0	5	17.1	17.6	5	13.3	3	12.0	13.7	5	15.0	3	10.3	12.8
Fayetteville...	2,500	1,800	4,300	4	10.7	6	28.0	17.1	3	8 0	3	14.4	10.3	2	5.3	5	25.0	12.0	2	5.3	2	9.6	6 9
Goldsboro......	2,800	2,200	5,000	1	4.3	2	10.9	7.2	1	4.3	4	21.8	12.0	...	.....	1	5.5	2.4	2	8.6	...	.....	4.8
Greensboro.....	4,000	2,000	6,000	...	.....	...	.....	.....	..	.....	...	.....	.....	...	.....	..	.....	....	...	.....	...	....	.....
Henderson......	1,785	1,715	3,500	...	.....	...	.....	.....	...	.....	...	.....	.....	...	.....	3	21.0	10.3	3	20.2	4	25.0	24.0
New Berne.....	3,000	4,000	7,000	2	12.0	10	40.0	28.8	2	12.0	11	44 0	31.2	...	....	...	.....	....	...	.....	13	41.6	26.0
Oxford..........	1,600	1,700	3,300	...	.....	...	.....	.....	...	.....	...	.....	.....	...	.....	...	.....	.....	1	8.6	1	7.5	8.0
Raleigh..........	8,000	7,000	15,000	11	16.5	15	25 7	20.8	10	15.0	17	29.1	21.6	7	10.5	11	18.8	14.4	5	7.5	14	24.0	15.2
Tarboro	1,300	1,200	2,500	...	.....	1	12.0	.....	1	9 2	1	10.0	9 6	2	18.4	...	.....	9.6	2	18.5	1	10.0	14.4
Salisbury........	....	....	5,000	...	.....	...	.....	.....	...	.....	...	....	.....	11	....	...	.....	26.4	5	....	2	....	16.8
Statesville......	....	....	3,500	...	.....	...	.....	.....	...	.....	...	.....	.....	...	.....	..	.....	.....	...	.. ..	..	..	.....
Washington...	2,400	1,600	4,000	5	25.0	4	30 0	27.0	4	20.0	4	30.0	24.0	2	10.0	2	15.0	12.0	...	.....	1	7.5	3 0
Wilmington...	9,000	14,000	23,000	6	8.0	25	21.4	16.2	16	21.3	20	17.1	18 8	13	17.3	21	18 0	17.7	10	13.3	23	19.7	17 2

MORTUARY REPORT FROM FIFTEEN TOWNS FOR 1888.—(CONTINUED.)

	MAY.					JUNE.					JULY.					AUGUST.				
	WHITE.		COL'D.			WHITE.		COL'D.			WHITE.		COL'D.			WHITE.		COL'D.		
	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.
Asheville	8	16.0	10	30.0	21.6	10	20.0	8	24.0	21.6	8	14.8	11	37.7	22.8	6	9.0	13	48.3	22.8
Charlotte	9	18.0	12	28.8	22.9	7	14.0	11	24.1	19.7	...	......	...	......	......	9	18.0	13	31.2	24.0
Durham	5	13.3	5	20.0	16.0	7	12.0	6	20.6	19.5	1	2.2	5	20.0	9.0	3	7.2	6	24.0	13.4
Fayetteville	7	18.7	7	33.6	24.0	6	16.0	8	38.4	24.0	2	5.3	2	9.6	6.8	5	13.3	2	9.6	12.0
Goldsboro	2	8.6	2	10.9	9.6	2	8.6	2	10.9	9.6	3	13.0	3	16.3	14.4	1	3.6	1	4.8	48.0
Greensboro	...	......	...	......	......	...	......	...	......	......	...	......	...	......	.....	4	......	3	......	14.4
Henderson	1	6.7	2	14.0	10.3	2	13.4	2	14.0	14.0	3	20.2	5	35.0	27.4	1	6.0	1	6.0	6.8
New Berne	1	9.6	9	30.9	20.0	5	20.0	15	45.0	31.3	1	4.0	11	30.0	18.9	4	15.9	19	57.0	39.3
Oxford	2	17.1	...	......	8.0	2	17.0	1	7.5	12.0	2	16.0	4	30.0	23.2	4	31.2	9	34.8	33.6
Raleigh	13	19.5	28	48.0	32.8	17	25.5	20	34.3	29.6	8	12.0	23	39.4	24.8	9	13.4	21	36.0	24.0
Tarboro	2	18.5	1	10.0	14.4	1	9.2	...	......	4.8	...	......	...	......	......	2	21.7	...	......	96.0
Salisbury	...	......	...	......	.....	...	......	...	......	......	4	......	2	.....	......	3	......	1	......	11.4
Statesville	...	......	...	......	......	...	......	...	......	......	...	......	...	......	......	...	......	...	......	......
Washington	4	20.0	...	......	12.0	2	10.0	1	7.5	9.0	5	25.0	6	45.0	33.0	1	4.9	7	51.6	24.0
Wilmington	23	30.7	37	31.7	31.3	26	34.7	38	32.6	33.4	11	14.7	27	23.0	19.8	12	15.9	33	28.0	22.8

MORTUARY REPORT FROM FIFTEEN TOWNS FOR 1888.—(CONTINUED.)

	SEPTEMBER.					OCTOBER.					NOVEMBER.					DECEMBER.					Total number of deaths during this year.	Annual death rate per 1,000.
	WHITE.		COL'D.			WHITE.		COL'D.			WHITE.		COL'd.			WHITE.		COL'D.				
	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	No. of deaths.	Temporary annual death-rate per 1,000.	Total temporary annual death-rate per 1,000.		
Asheville	4	9.0	8	32.0	25.5	1	......	7	......	......	1	.....	7	.....	......	2	3.4	5	19.2	8.4	193	32.0
Charlotte	6	12 0	16	38.0	25.0	6	9.0	14	32.0	20 5	7	12.1	10	24.0	15.1	9	12.0	5	12.7	12.9	168	15.2
Durham	5	13.3	6	24.0	18.6	4	13.3	3	24.0	18.6	4	12.0	2	24.0	18.0	3	7.2	5	18.8	12.0	119	19 7
Fayetteville	1	2.6	4	19 2	10.9	5	2.6	5	19.2	10.9	3	7.2	5	24 0	12.1	3	7.2	5	24.0	12.1	99	23.0
Goldsboro	1	4.2	2	10.9	7.5	2	4.2	2	10.9	7.5	1	7.2	...	12.8	12.1	3	12.0	3	12.3	12.2	42	8.4
Greensboro	4	......	6	......	12.0	4	......	6	......	12.0	4	12.0	3	12.6	12.1	3	9.0	2	12.3	9.6	39	6.5
Henderson	1	6.7	4	27.9	17.3	2	6.7	5	27.9	17.3	...	......	2	24.3	12.1	2	13.2	2	12.0	13.2	43	10.2
New Berne	6	3.6	25	12.4	8.0	7	3.6	14	12.4	8.0	3	12.0	7	24.0	18.0	7	17.6	13	13.2	33.6	185	20.6
Oxford	5	39.9	2	15.0	27.4	5	39.9	2	15.0	27.4	2	12.6	2	6.0	9.6	...	......	...	38.4	......	41	13.3
Raleigh	15	22.5	16	27.4	24.9	15	22.5	12	27.4	21.9	5	7.2	12	12.8	12.1	5	7.2	15	......	15.6	324	21.6
Tarboro	1	9.2	1	......	9.2	2	9.2	...	......	9.2	...	.....	...	......	.....	...	......	...	25.2	......	18	8.0
Salisbury	4	......	...	......	9.6	3	......	...	......	9.6	...	......	...	......	......	...	......	...	......	......	35	7.0
Statesville	...	......	...	......	......	6	.....	1	.....	......	...	......	...	......	......	...	......	...	......	.....	7	2.0
Washington	3	15.0	5	37.5	26.5	3	15.0	5	37.5	26.5	3	12.6	27	......	5.6	2	10.0	4	30.0	28.0	68	17.0
Wilmington	6	7.9	28	24.0	15.9	13	7.9	32	24.0	15.9	7	7.2	...	13.0	11.0	10	12.1	19	15.6	14.5	497	21.6

MORTUARY REPORT FOR JANUARY, 1887.

FROM FOUR TOWNS.

CAUSES OF DEATH.	Wilm'gton.		Charlotte.		Asheville.		Fayetteville.		Totals by Races.	
	W.	C.	W.		W.	C.	W.	C.	W.	C.
Accident		1	1	1					1	2
Apoplexy				1						1
Brain, congestion of		1								1
Brain, softness of						1				1
Bronchitis, acute						3				
Consumption	3	4		2	4		1	1	8	7
Convulsions		1								1
Cholera Infantum			1						1	
Debility		2								2
Dropsy		4								4
Dysentery		1	1						1	1
Fever, congestive		2								2
Gastro-enteritis					1				1	
Heart, disease of	1	3					1		2	3
Lungs, congestion of	1								1	
Meningitis, spinal		1		1						2
Measles					2	2			2	2
Old age							1		1	
Paralysis		1		1						2
Pyœmia	1								1	
Still-born	2	2							2	2
Spasm				1						1
Teething		1								1
Tetanus traumatis		1								1
Womb, rupture of		1								1
Pneumonia	3	3	2	1	1	2	2	1	8	7
	11	29	5	8	8	8	5	2	29	47
Total by towns	40		13		16		7		76	

TOWNS.	Population.			Temporary annual death rate per 1,000.		
	W.	C.	Total.	W.	C.	Total.
Wilmington	8,000	13,000	21,000	16.5	26.8	22.9
Charlotte	6,000	5,000	11,000	10.0	19 2	14.2
Asheville	4,500	1,500	6,000	21.3	64.0	32.0
Fayetteville	2,500	1,800	4,300	24.0	13.3	19.5

MORTUARY REPORT FOR FEBRUARY, 1887.

FROM FOUR TOWNS.

CAUSES OF DEATH.	Wil-mingt'n		Char-lotte.		Ashe-ville.		Fayette-ville.		Totals by Races.	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.
Brain, congestion of	...	1	...	...	...	...	...	...	...	1
Bronchitis, capillary	...	...	...	...	...	2	...	...	...	2
Consumption	.	1	..	4	3	1	1	2	4	8
Cholera infantum	...	...	1	...	...	...	...	...	1	...
Convulsions	...	...	...	1	1	...	1	...	2	1
Debility	...	2	...	...	...	...	1	...	1	2
Dropsy	...	1	...	...	...	...	...	...	...	1
Dysentery	...	...	...	1	...	...	...	...	..	1
Fever, typho-malarial	1	...	...	...	...	.	...	...	1	...
Fever, typhoid	1	1	.	...	1	...	...	...	2	1
Heart -disease	..	1	1	...	...	...	...	...	1	1
Inanition	...	...	2	2	...	...	...	...	2	2
Jaundice, obstructive	...	1	..	...	...	...	...	...	...	1
Liver cinhosis	1	..	...	...	...	...	...	...	1	...
Laryngismus stridulus	...	...	...	...	...	1	...	...	...	1
Lungs, congestion of	...	...	1	1	..	...	..	..	1	...
Measles	...	...	1	1	4	5	...	...	5	6
Meningitis, cerebro-spinal	1	1	...	...	...	...	...	...	1	1
Old age	..	2	...	...	...	...	...	...	...	2
Pneumonia	..	1	2	2	1	...	...	...	3	3
Pneumonia, typhoid	...	1	..	...	...	...	...	...	...	1
Rheumatism	...	...	...	...	1	...	...	...	1	...
Still-born	...	3	...	...	...	...	...	...	...	3
Spasm	...	...	...	1	...	...	...	...	...	1
Tetanus	...	1	...	..	...	..	...	...	...	1
Tabes Mesenterieus	...	1	...	...	...	...	...	...	...	1
Whooping-cough	...	...	...	...	...	2	...	...	...	2
Accident	...	1	...	...	..	..	...	...	...	1
	4	19	8	12	11	11	3	2	26	44
Total bv towns	23		20		2		5		70	

TOWNS.	Population.			Temporary annual death rate per 1,000.		
	W.	C.	Total.	W.	C.	Total.
Wilmington	8,000	12,000	20,000	6.0	19.0	13.8
Charlotte	6,000	5,000	11,000	16.0	28.8	21.7
Asheville	4,500	1,500	6,000	29.3	88.0	44.0
Fayetteville	2,500	1,800	4,300	14.4	13.3	13.9

MORTUARY REPORT FOR MARCH, 1887.

FROM SIX TOWNS.

CAUSES OF DEATH.	Wil-mingt'n		Raleigh.		Char-lotte.		New Berne.		Ashe-ville.		Fayette-ville.		Totals by Races	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.
Pulmonary diseases	2	6	2	4	4	9	1	3	7	6	1	...	17	28
Heart-disease	...	...	...	...	...	2	...	...	...	...	...	...	...	2
Brain disease	...	...	...	...	1	...	...	1	...	...	...	...	1	1
Scarlet fever	1	...	...	...	...	...	...	...	...	...	...	...	1	...
Typhoid fever	1	...	...	...	...	...	...	...	...	...	...	...	1	...
Measles	...	...	...	...	1	1	...	...	...	2	...	...	1	3
Paralysis	2	...	...	...	...	...	...	...	1	1	1	...	4	1
Old age	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Still-born	1	4	1	3	...	...	...	...	...	...	...	3	2	10
Accident	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Other causes	2	11	3	2	1	1	1	4	...	...	...	2	7	21
	10	25	6	9	7	13	2	8	8	9	2	5	26	68
Totals by towns	35		15		20		10		17		7		104	

TOWNS.	Population.			Temporary annual death rate per 1,000.		
	W.	C.	Total.	W.	C.	Total.
Wilmington	8,000	12,000	20,000	1.5	25.0	21.0
Raleigh	8,000	7,000	15,000	9.0	15.4	12.0
Charlotte	6,000	5,000	11,000	14.0	31.2	21.8
New Berne*	......	......	......	......	......	......
Asheville	4,500	1,500	6,000	21.3	72.0	34.0
Fayetteville	2,500	1,800	4,300	9.6	33.3	19.5

*Population not given.

MORTUARY REPORT FOR APRIL, 1887.

FROM FIVE TOWNS.

CAUSES OF DEATHS.	New Berne.		Wil-ming-ton.		Ashe-ville.		Fayette-ville.		Cha-lotte.		Raleigh.		Totals by Races	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.
Typhoid fever			1		1								2	
Scarlet fever			1	1									1	1
Malarial fever				1					3				3	1
Diphtheria														
Whooping-cough						1								1
Measles										2				2
Pneumonia			1	3	6				4	7			11	10
Consumption			1	5	1	1		1		1			2	8
Brain diseases									1	3			1	3
Heart diseases			1	5				1					1	6
Neurotic diseases				1					1				1	1
Diarrhœal diseases				1				1					1	2
All other diseases	2	3	6	9	1	1			2	1			11	14
Accident								1						1
Suicide														
Still-born		1	2	4	1			2					3	7
Under five years		7	4	10	3								7	20
	2	4	13	30	10	3	1	3	11	12			37	57
Totals by towns	6		43		13		4		23				94	

REPORTER.	TOWNS.	Population.*			Temporary annual death rate per 1,000.		
		W.	C.	Total.	W.	C.	Tot.
Dr. R. D. Hancock	New Berne*	3,000	4,000	7,000	8.0	30.0	25.7
Dr. F. W. Potter	Wilmington*	9,900	13,500	23,400	15.8	26.6	22.1
Dr. W. L. Hilliard	Asheville	5,625	1,875	7,500	21.3	19.1	20.8
Dr. J. A. Hodges	Fayetteville	2,500	1,809	4,300	4.8	40.0	19.5
	Charlotte	6,000	5,000	11,000	22.0	28.8	25.1
Dr. James McKee	Raleigh†						

*Estimate based on basis of 4½ of population to each registered voter.

†No report.

MORTUARY REPORT FOR MAY, 1887.

FROM SIX TOWNS.

Causes of Death.	Charlotte.		Asheville.		Durham.		Fayetteville.		Wilmingt'n		New Berne.		Raleigh.		Totals by Races	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.
Typhoid fever										1						1
Scarlet fever																
Malarial fever									1			1			1	1
Diphtheria																
Whooping-cough				1		1					2	8			2	10
Measles	1				1										2	
Pneumonia			2	1	1					1					3	2
Consumption		6	2		1			1		5		4			3	16
Brain diseases								1								1
Heart diseases		1					1		3						4	1
Neurotic diseases												1				1
Bowel diseases	11	2	1	2		2	1	2		3					13	11
All other diseases	4	6			1				2	6	2	4			9	16
Accident			1	2						7	1				2	9
Suicide						1										1
Still-born			1						1			1			2	1
Under five years			2	3	4	2	1	2			3	10			10	17
	16	15	7	6	4	4	2	4	7	23	5	19	...		51	79
Totals by towns	31		13		8		6		30		24		...		120	

Reporter.	Towns	Population.			Temporary annual death rate per 1,000		
		W.	C.	Total.	W.	C.	Tot.
J. Scarr	Charlotte	6,000	5,000	11,000	32.0	36.0	33.8
Dr. N. L. Hilliard	Asheville	4,611	2,607	7,248	18.1	27.6	21.5
Dr. N. M. Johnson	Durham	3,500	2,500	6,000	13.7	19.2	16.0
Dr. J. A. Hodges	Fayetteville	2,500	1,800	4,300	9.6	26.1	16.8
Dr. F. W. Potter	Wilmington	9,900	13,500	23,400	8.5	20.4	15.4
Dr. James McKee	Raleigh*						
S. Fulcher, City Clerk	New Berne	2.413	5,929	8.342	24.9	39.3	34.5

*No report received.

MORTUARY REPORT FOR JUNE, 1887.

FROM FIVE TOWNS.

CAUSES OF DEATH.	Asheville.		Charlotte.		Durham.		Fayetteville.		Wilm'gton.		New Berne.		Raleigh.		Totals by Races	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C
Typhoid fever	...	1	...	...	1	...	...	...	...	2	...	...	...	...	1	3
Scarlet fever	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	..
Malarial fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..
Diphtheria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..
Whooping-cough	1	1	...	...	...	...	...	...	...	1	...	...	...	...	1	2
Measles	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..
Pneumonia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..
Consumption	3	...	...	3	...	1	1	...	1		...	...	...	...	4	7
Brain diseases	1	...	...	1	...	...	1	...	1	...	...	...	...	...	3	1
Heart diseases	1	...	2	3	...	...	...	...	...	2	...	...	...	...	3	5
Neurotic diseases	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	..
Bowel diseases	10	9	12	12	3	1	...	4	4	4	...	...	...	...	29	30
All other diseases	4	...	2	...	...	...	1	...	3	5	...	...	...	...	10	5
Accident	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1
Suicide	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..
Still-born	...	...	1	...	...	1	...	...	2	4	...	...	...	...	3	5
Under five years,	12		.....		5		4		...		......		.....		21	
	20	11	18	19	4	3	3	4	12	21		..	.	.	46	59
Totals by towns	31		37		7		7		33		.....		.....		105	

REPORTER.	TOWNS.	Population.			Temporary annual death rate per 1,000		
		W.	C.	Total.	W.	C.	Tot.
Dr. W. L. Hilliard	Asheville	4,641	2,607	7,248	51.7	50.6	51.3
J. Scarr	Charlotte	6,000	5,000	11,000	38.0	45.6	41.5
Dr. N. M. Johnson	Durham*	3,000	2,500	5,500	16.0	14.4	15.3
Dr. J. A. Hodges	Fayetteville	2,500	1,800	4,300	14.4	30.0	19.5
Dr. F. W. Potter	Wilmington	9,900	13,500	23,400	14.5	18.7	17.0
......	New Berne**	......	......	......	...	...	...
......	Raleigh**	......	......	......	...	...	...

*Dr. Johnson doubts correctness of this report.

**No report received.

MORTUARY REPORT FOR JULY, 1887.

FROM SIX TOWNS.

CAUSES OF DEATH.	Asheville.		Charville.		Durham		Fayetteville		Wilmingt'n		New Berne.		Raleigh.		Totals by Races	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.
Typhoid fever	2	1	1	2	1	...	...	...	...	1	...	...	1	1	5	5
Scarlet fever	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Malarial fever	...	...	...	...	...	...	...	1	2	1	...	...	...	1	2	3
Diphtheria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Who'p'g-cough	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Measles	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pneumonia	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Consumption			...	...	...	1	...	...	1	...	...	...	3	1	6	2
Brain diseases		...	...	1	1	..	1	...	2	2	...	...	3	1	8	5
Heart diseases	...	...	...	2		...	...	...	1	4	...	...	3	3	4	9
Neurotic dis'es	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	2
Bowel diseases	3	3	2	1	1	...	...	...	4	4	...	...	2	2	12	10
All other dis'es	2	...	5	2	...	2	...	2	4	10	...	...	4	6	15	22
Accident	...	...	...	1	...	...	...	...	...	...	...	...	1	...	1	1
Suicide	...	...	...	...	...	...	...	...	...	1	...	...	..	...	...	1
Still-born	...	...	...	...	...	...	...	...	2	1	...	...	...	3	2	4
Under 5 years	4		......		3		3		......		......		......		10	
	11	4		1	3	3	1	3	16	25	..	..	17	18	55	74
Totals by towns	15		18		6		4		41		......		35		129	

REPORTER.	TOWNS.	Population.			Temporary annual death rate per 1,000		
		W.	C.	Total.	W.	C.	Tot.
Dr. W. L. Hilliard	Asheville	4,641	2,607	7,248	28.4	18.4	24.8
J. Scarr	Charlotte	6,000	5,000	11,000	16.0	24.0	19.6
Dr. N. M. Johnson	Durham	4,500	2,500	7,000	10.7	14.4	12.0
Dr. J. A. Hodges	Fayetteville	2,500	1,800	4,300	4.8	20.0	11.2
Dr. F. W. Potter	Wilmington	9,900	13,500	23,400	18.2	23.1	21.0
Dr. Jas. McKee	Raleigh	8,000	7,000	15,000	27.0	29.1	28.0

MORTUARY REPORT FOR AUGUST, 1887.

FROM SIX TOWNS.

CAUSES OF DEATH.	Asheville.		Charlotte.		Durham		Fayetteville.		Wilm'g-ton.		New Berne.		Raleigh.		Totals by Races	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.
Typhoid fever	3	...	...	1	...	...	...	...	...	...	...	...	2	1	5	2
Scarlet fever	...	...	...	...	...	...	...	1	2	...	...	...	...	...	2	1
Malarial fever	...	...	...	...	...	...	...	...	2	1	...	...	1	2	3	3
Diptheria	...	...	...	1	1	...	4	2	...	...	...	...	4	2	9	5
Whoop'g-cough	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Measles	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pneumonia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Consumption	...	...	1	3	1	...	...	...	...	3	...	...	1	1	3	4
Brain diseases	...	...	...	...	...	...	...	...	...	2	...	...	...	1	...	2
Heart diseases	...	...	1	...	1	...	...	...	2	...	...	...	2	1	6	1
Neurotic dis'es	...	...	...	2	...	...	...	...	...	3	...	...	...	...	...	5
Bowel diseases	2	2	1	2	...	2	1	1	1	2	...	...	1	2	6	11
All other dis'es	1	...	2	4	2	4	...	1	...	9	...	...	2	3	7	18
Accident	...	...	...	1	...	...	...	...	2	1	...	...	...	...	2	2
Suicide	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Still-born	...	...	...	...	1	...	1	...	...	6	...	...	...	1	2	7
Under 5 years	3		--		--		--		--		--		10		13	
	6	2	5	14	6	6	6	5	9	27	..	..	13	14	42	61
Totals by towns	8		19		12		11		36		--		27		103	

REPORTER.	TOWNS.	Population.			Temporary annual death rate per 1,000		
		W.	C.	Total.	W.	C.	Tot.
Dr. W. L. Hilliard	Asheville	4,641	2,607	7,248	15.5	9.2	13.2
J. Scarr	Charlotte	6,000	5,000	11,000	10.0	33.6	20.7
Dr. N. M. Johnson	Durham	4,500	2,500	7,000	16.0	28.8	20.6
Dr. J. A. Hodges	Fayetteville	2,500	1,800	4,300	28.8	33.3	30.7
Dr. F. W. Potter	Wilmington	9,900	13,500	23,400	21.0	24.0	18.5
Dr. Jas. McKee	Raleigh	8,000	7,000	15.000	19.5	24.0	21.6

MORTUARY REPORT FOR SEPTEMBER, 1887.

FROM SIX TOWNS.

CAUSES OF DEATH.	Asheville.		Charlotte		Durham		Fayetteville.		Wilm'gton.		New Berne.		Raleigh.		Totals by Races	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.
Typhoid fever	2	...	1	3	1	...	...	...	...	..	...	...	...	3	4	6
Scarlet fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Malarial fever	...	...	...	...	1	...	..	2	2	3	...	...	...	...	3	5
Diphtheria	...	..	...	...	...	...	3	11	..	1	...	..	9	...	12	12
Who'ing-cough	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Measles	..	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pneumonia	1	...	...	1	1	.	...	...	...	...	...	...	1	1	3	2
Consumption	2	...	...	...	...	1	...	..	1	5	...	...	.	2	3	8
Brain diseases	...	...	...	...	...	...	...	...	2	6	...	...	1	1	3	7
Heart diseases	1	...	...	3	1	1	...	...	...	...	...	...	...	...	2	4
Neurotic dis'es	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bowel diseases	...	.	2	1	..	1	.	.	..	2	...	...	3	6	5	10
All other dis'es	2	5	1	1	1	...	2	..	3	...	...	...	1	8	10	14
Accident	1	...	...	...	...	...	...	...	5	23	...	...	...	...	6	23
Suicide	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Still-born	...	.	...	...	...	1	..	...	...	2	...	...	...	.	..	3
	9	5	4	9	5	4	5	13	13	42	..	..	15	21	51	94
Totals by towns	14		13		9		18		55		..		36		145	
Under 5 years	7				..		..		..		..		..		7	

REPORTER.	TOWNS.	Population.			Temporary annual death rate per 1,000		
		W.	C.	Total.	W.	C.	Tot.
Dr. W. L. Hilliard	Asheville	4,641	2,607	7,248	28.1	22.8	22.9
Dr. J. Scarr	Charlotte	6,000	5,000	11,000	7.9	22.3	15.2
Dr. N. M. Johnson	Durham	4,500	2,500	7,000	13.2	19.2	14.4
Dr. J. A. Hodges	Fayetteville	2,500	1,000	4,300	2.4	8.6	5.0
Dr. F. W. Potter	Wilmington	9,900	13,500	23,400	15.6	36.1	27.6
...	New Berne*	...	...	...	.	.	...
Dr. Jas. McKee	Raleigh	8,000	7,000	15,000	51.6	37.2	28.8

* No report received.

MORTUARY REPORT FOR OCTOBER, 1887.

FROM SIX TOWNS.

CAUSES OF DEATH.	Asheville.		Charlotte.		Durham.		Fayetteville.		Wilmingt'n		New Berne.		Raleigh.		Totals by Races	
	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.	W.	C.
Typhoid fever				1	1		2			1				1	3	3
Scarlet fever				1					1						1	1
Malarial fever				1			1	2	2	3					3	6
Diptheria	1						1	2					3	1	5	3
Whoop'g-cough																
Measles					1											1
Pneumonia					2								2	2	4	2
Consumption				3					4	5				2	4	10
Brain diseases										1			1		1	1
Heart diseases	1									2				1	1	3
Neurotic disea's					1					1			2		3	1
Bowel diseases	1		1	2		1		1	2	1				3	3	8
All other dis'es	2	6	2	8	2	3			1	6			7	5	14	28
Accident	3		1							1			1		5	1
Suicide																
Still-born		1								2			2	1	2	3
	8	7	4	16	7	4	4	5	10	23			18	16	49	71
Totals by towns	15		20		11		9		33				34		120	
Under 5 years					5		2								7	

REPORTER.	TOWNS.	Population.			Temporary annual death rate per 1,000.		
		W.	C.	Total.	W.	C.	Total.
Dr. W. L. Hilliard	Asheville	4,641	2,607	7,248	17.2	26.8	20.7
Dr. J. Scarr	Charlotte	6,000	5,000	11,000	6.6	32.0	18.1
Dr. N. M. Johnson	Durham	4,500	2,500	7,000	15.5	16.0	13.7
Dr. J. A. Hodges	Fayetteville	2,500	1,800	4,300	16.0	27.7	20.9
Dr. F. N. Potter	Wilmington	9,900	13,500	23,400	11.1	17.3	14.1
	New Berne*						
Dr. James McKee	Raleigh	8,000	7,000	15,000	22.5	22.8	22.0

*No report received.

MORTUARY REPORT FOR NOVEMBER, 1887.

FROM EIGHT TOWNS.

CAUSES OF DEATH	Asheville.		Charlotte.		Fayetteville.		Durham.		Raleigh.		Tarboro		Wilmingt'n		New Berne.		Totals by Races	
	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C
Typhoid fever	...	..	1	1	...	..	...	..	1	1	...	..	2	..	...	..	4	2
Scarlet fever	...	..	...	..	...	..	...	..	...	..	...	..	...	..	...	..	...	..
Malarial fever	...	..	..	..	..	..	...	..	...	..	...	.	1	5	...	2	1	7
Diphtheria	...		...	...	...	1	...	..	3	1	...	..	...	..	...	..	3	2
Whooping-cough	...		..	..	.	..	..	..	..	..	...	..	...	..	...	.	...	..
Measles	...	.	...	..	...	..	...	..	..	..	...	..	...	..	...	..	...	..
Pneumonia	2	..	2	1	1	1	1	1	2	1	1	..	2	2	...	..	11	6
Consumption	1	..	1	2	...	..	2	1	2	1	...	..	1	6	..	3	7	13
Brain diseases	...	..	...	..	...	..	...	..	...	4	...	2	...	2	.	..	...	8
Heart diseases	..	1	1	.	1	..	...	..	...	1	..	..	1	3	...	..	3	5
Neurotic diseases	...	..	...	1	...	..	...	2	1	1	...	..	1	3	...	..	...	..
Bowel diseases	...	..	...	1	...	..	...	..	...	..	...	..	...	1	...	..	..	..
All other diseases	3	1	1	1	...	1	3	..	6	4	...	1	1	5	3	4	14	17
Accident	...	..	...	1	...	..	...	..	...	..	...	..	...	..	...	..	...	1
Suicide		.	...	..	...	..	...	..	...	..	...	..	...	..	...	..	...	..
Still-born	2	..	...	..	...	..	...	..	1	..	..	..	1	..	..	1	4	1
	8	2	6	8	2	3	6	4	16	14	1	3	10	27	3	10	47	72
Totals by towns	10		14		5		10		30		4		37		13		119	
Under 5 years	4		.....		2		...		....		.....		.....		4		10	

REPORTER.	TOWNS.	Population.			Temporary annual death rate per 1,000.		
		W.	C.	Total.	W.	C.	Total.
Dr. W. L. Hilliard	Asheville	4,641	2,607	7,248	20.6	9.20	16.5
Dr. J. Scarr	Charlotte	6,000	5,000	11,000	12.0	19.2	15.3
Dr. J. A. Hodges	Fayetteville	2,500	1,800	4,300	9.6	20.0	13.9
Dr. N. M. Johnson	Durham	4,500	2,500	7,000	16.0	19.2	17.1
Dr. James McKee	Raleigh	8,000	7,000	15,000	24.0	24.0	24.20
Dr. J. M. Baker	Tarboro	1,300	1,200	2,500	9.2	30.0	19.2
Dr. F. H. Potter	Wilmington	9,900	13,500	23,400	12.1	24.0	18.9
S. Fulcher, City Cl'k	New Berne	2,000	5,000	7,000	18.0	24.0	18.5

MORTUARY REPORT FOR DECEMBER, 1886.

FROM NINE TOWNS.

CAUSES OF DEATH.	Asheville.		Charlotte.		Durham.		Fayetteville.		Raleigh.		Wilmingt'n		New Berne.		Washington.		Tarboro.		Totals by Races	
	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C
Typh'd fev'r	1	--	---	1	---	--	---	--	---	--	---	1	---	--	---	--	---	--	1	2
Scarlet fev'r	---	--	---	--	---	--	---	--	---	--	---	--	---	--	---	--	---	--	---	--
Malar'l fev'r	---	--	---	--	---	--	---	--	---	--	---	2	1	1	---	--	---	--	1	3
Diphtheria	---	1	---	--	---	--	---	--	---	--	---	--	1	--	---	--	---	--	1	1
Wh'p'g-c'gh	---	--	---	--	---	--	---	--	---	--	---	--	---	--	---	--	---	--	---	--
Measles	---	--	---	--	---	--	---	1	---	--	---	--	---	--	---	--	---	--	---	1
Pneumonia	2	2	2	--	1	--	---	1	2	2	---	--	---	1	---	--	---	--	7	6
Consumpt'n	---	1	---	2	---	1	1	--	1	1	2	--	1	3	---	1	---	--	5	9
Brain dis'es	1	--	---	--	---	1	1	--	---	1	3	--	---	--	---	--	---	--	5	2
Heart dis'es	1	--	---	--	---	--	---	--	---	--	---	--	---	--	---	1	---	--	1	1
Neurotic dis	---	--	---	--	---	--	---	--	---	--	---	--	1	1	1	--	---	--	2	1
Bowel dis'es	---	--	---	1	---	--	---	1	1	--	---	1	---	--	---	--	1	--	2	3
All oth'r dis.	7	2	2	2	1	1	1	--	1	8	5	16	---	2	---	--	---	--	17	31
Accident	---	--	---	--	---	--	---	1	---	--	---	--	---	--	---	--	---	1	---	2
Suicide	---	--	---	--	---	--	---	--	---	--	---	1	---	--	---	--	---	--	---	1
Still-born	1	--	---	2	---	1	---	--	---	2	---	3	1	1	---	--	---	--	2	9
	13	6	4	4	2	4	3	4	5	14	10	24	5	9	1	2	1	1	40	71
Totals by towns	19		12		6		7		19		34		14		3		2		111	
Under 5 y'rs	7		8		3		-----		8		11		1		1		-----		39	

REPORTER.	TOWNS.	Population.			Temporary annual death rate per 1,000		
		W.	C.	Total.	W.	C.	Tot.
Dr. W. L. Hilliard	Asheville	4,641	2,607	7,248	33.6	27.6	31.4
Dr. J. Scarr	Charlotte	6,000	5,000	11,000	8.0	19.2	13.1
Dr. N. M. Johnson	Durham	4,500	3,000	7,500	5.3	16.0	9.6
Dr. J. A. Hodges	Fayetteville	2,500	1,800	4,300	14.4	26.6	19.5
Dr. Jas. McKee	Raleigh	8,000	7,000	15,000	7.5	24.0	15.1
Dr. F. W. Potter	Wilmington	9,000	14,000	23,300	13.3	20.6	17.7
S. Fulcher, City Clerk	Newbern	2,000	3,000	5,000	30.0	36.0	33.6
Dr. S. T. Nicholson	Washington	2,400	1,600	4,000	5.0	15.0	9.0
Dr. J. M. Baker	Tarboro	1,300	1,200	2,500	9.3	10.0	9.6

MORTUARY REPORT FOR JANUARY, 1888.

FROM TEN TOWNS.

Causes of Death.	Asheville.		Charlotte.		Durham.		Fayetteville.		Goldsboro.		New Berne.		Raleigh.		Tarboro		Wash'gton.		Wilm'gton.		Totals by Races	
	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C
Accident	1			2						1		3		1							1	7
All other diseases	2	5	:	3	2	2					1	2	3	4			1	3	4	10	13	27
Brain diseases	22	6	1		1												1		1		26	6
Bowel diseases							1	1					1				1				3	1
Diphtheria					1																1	
Consumption	2	1	1	1	1	2		1	1	1		2	1	4	1				2	7	9	20
Malarial fever							1	2				3								1	1	6
Measles																						
Heart diseases				1							1						1			1	2	2
Neurotic diseases													3	3						1	3	4
Pneumonia		1			1	1		2					3	2			1	1		2	5	9
Scarlet fever																						
Typhoid fever							1														1	
Suicide																						
Still-born	1		1	2	1		1							1						2	4	3
Whooping-cough																						
	28	13	3	9	7	5	4	6	1	2	2	10	11	15	1	..	5	4	6	24	64	85
Totals by towns.	41		12		12		10		3		12		26		1		9		30		149	
Under five years,	7		8		5		1		1		3		...		....		3				28	

Reporters.	Towns.	Population.			Temporary annual death rate per 1.000.		
		W.	C.	Total.	W.	C.	Total.
Dr. H. B. Weaver	Asheville	5,000	3,000	8,000	67.3	52.0	61.5
Dr. J. Scarr	Charlotte	6,000	5,000	11.000	6.0	26.4	15.3
Dr. N. M. Johnson,	Durham	4,000	3,500	7,500	21.0	17.1	19.2
Dr. J. A. Hodges	Fayetteville	4,500	2,500	7.000	10.7	28.0	17.1
...., Mayor	Goldsboro	2,800	2,200	5,000	4.3	10.9	7.2
S. Fulcher, CityCl'k	New Berne	2,000	3,000	5,000	12.0	40.0	28.8
Dr. James McKee	Raleigh	8,000	7,000	15,000	16.5	25.7	20.8
Dr. J. M. Baker	Tarboro	1,500	1,000	2,500	....	12.0	4.8
Dr. S. T. Nicholson	Washington	2,400	1.600	4,000	25.0	30.0	27.0
Dr. F. W. Potter	Wilmington	9,000	14.000	23.000	8.0	21.4	16.2

MORTUARY REPORT FOR FEBRUARY, 1888.

FROM TEN TOWNS.

CAUSES OF DEATH.	Asheville.		Charlotte.		Durham.		Fayetteville.		Goldsboro.		New Berne.		Raleigh.		Tarboro		Washington.		Wilmingt'n		Totals by Races	
	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C
Typhd. fev'r			1	2															1		2	2
Scarlet fever																						
Malarial f'vr					1							2									1	2
Diptheria																						
Wh'p'g-c'gh																						
Measles	1																		2		3	
Pneumonia			1		1	2		1				3	3	9				1	2	1	7	16
Consumpt'n			1	3	2			1	1	1		3	1	3		1	1	2	1	2	7	16
Brain dis'es	6	1					1						1	2				1			8	4
Heart dis'es				1	1		1	1			1								1	2	3	4
Neurotic d's																				5		5
Bowel dis'es																						
All other d's	1	6	1	5	1	2				3	1	3	3	2	1		3		8	7	19	28
Accident				2			1						1	1							2	3
Suicide																						
Still-born				3		1							1						1	3	2	7
	8	7	4	16	6	5	3	3	1	4	2	11	10	17	1	1	4	4	16	20	54	87
Tot'ls by t'ns	15		20		11		6		5		13		27		2		8		36		141	
Under 5 y'rs	2		9		2		.....		3		5		12		1		1		13		48	

REPORTER.	TOWNS.	Population.			Temporary annual death-rate per 1,000.		
		W.	C.	Total.	W.	C.	Total.
Dr. H. B. Weaver	Asheville	5,000	3,000	8,000	19.2	28.0	22.5
Dr. J. Scarr	Charlotte	6,000	5,000	11,000	8.0	38.4	21.8
Dr. N. M. Johnson	Durham	4,000	3,500	7,500	18.5	17.1	17.6
Dr. J. A. Hodges	Fayetteville	4,500	2,500	7,000	8.0	14.4	10.3
——— ———, Mayor	Goldsboro	2,800	2,200	5,000	4.3	21.8	12.0
S. Fulcher, City Cl'k	New Berne	2,000	3,000	5,000	12.0	44.0	31.2
Dr. James McKee	Raleigh	8,000	7,000	15,000	15.0	29.1	21.6
Dr. J. M. Baker	Tarboro	1,300	1,200	2,500	9.2	10.0	9.6
Dr. S. T. Nicholson	Washington	2,400	1,600	4,000	20.0	30.0	24.0
Dr. F. W. Potter	Wilmington	9,000	14,000	23,000	21.3	17.1	18.8

MORTUARY REPORT FOR MARCH, 1888.

FROM TEN TOWNS.

CAUSES OF DEATH.	Asheville.		Charlotte.		Durham.		Fayetteville.		Goldsboro.		New Berne.		Raleigh.		Tarboro.		Washington.		Wilmington		Henderson.		Salisbury.		Totals by Races.	
	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C
Typhoid fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Scarlet fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Malarial fever	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Diphtheria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Whooping-cough	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Measles	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	1	1
Pneumonia	2	...	...	...	3	4	...	1	...	...	...	...	1	4	...	...	...	...	2	3	...	...	...	1	8	13
Consumption	4	...	...	...	1	1	...	1	...	1	...	...	2	3	...	...	...	...	2	4	...	1	...	6	9	15
Brain diseases	7	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	1	...	1	...	...	...	...	9	3
Heart diseases	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1	1	1	...	...	...	...	1	3
Neurotic diseases	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	1	2	...	...	...	...	3	2
Bowel diseases	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	2	...
All other diseases	5	9	...	...	1	...	...	...	...	...	...	...	3	4	...	...	1	...	6	9	...	...	4	...	19	22
Accident	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Suicide	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Still-born	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	3
	18	11	...	...	5	5	2	5	...	1	...	...	7	11	2	...	2	2	13	21	...	3	4	7	52	64
Totals by towns	29		......		10		7		1		.....		18		2		4		34		3		11		116	
Under five years.	8		......		2		2		11		......		4		2		......		5		......		......		23	

REPORTERS.	TOWNS.	Population.			Temporary annual death-rate per 1,000.		
		W.	C.	Total	W.	C.	Total
Dr. H. B. Weaver	Asheville	5,000	3,000	8,000	43.2	44.0	43.5
Dr. J. Scarr	Charlotte	6,000	5,000	11,000	....	....	....
Dr. N. M. Johnson	Durham	4,500	3,000	7,500	13.3	12.0	13.7
Dr. J. A. Hodges	Fayetteville	4,500	2,500	7,000	5.3	25.0	12.0
J. E. Peterson, Mayor	Goldsboro	2,800	2,200	5,000	....	5.5	2.4
S. Fulcher, City Clerk	New Berne	2,000	3,000	5,000	....	....	....
Dr. James McKee	Raleigh	8,000	7,000	15,000	10.5	18.8	14.4
Dr. J. M. Baker	Tarboro	1,300	1,200	2,500	18.4	....	9.6
Dr. S. T. Nicholson	Washington	2,400	1,600	4,000	10.0	15.0	12.0
Dr. F. W. Potter	Wilmington	9,000	14,000	23,000	17.3	18.0	17.7
Dr. F. B. Harris	Henderson	1,785	1,715	3,500	....	21.0	10.3
Dr. J. J. Summerell	Salisbury	....	....	5,000	....	....	26.4

MORTUARY REPORT FOR APRIL, 1888.

FROM TWELVE TOWNS.

CAUSES OF DEATH.	Asheville.		Durham.		Fayetteville.		Goldsboro.		Henderson.		New Berne.		Oxford.		Raleigh.		Salisbury.		Tarboro.		Wilmington.		Washington.		Totals by Races.	
	W	C.	W	C.	W	C.	W		W	C.	W	C.	W	C	W	C.	W	C.	W	C.	W	C.	W	C.	W	C.
Typhoid fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1
Scarlet fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Malarial fever	...	...	...	...	...	...	...	...	...	...	...	4	†1	...	...	...	...	...	...	...	...	...	...	...	1	4
Diphtheria	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Whooping-cough	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Measles	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	1	2
Pneumonia	2	...	2	1	1	1	...	...	1	...	...	1	...	...	...	8	...	...	...	...	...	...	...	...	6	6
Consumption	...	...	2	1	...	...	...	...	1	1	...	2	...	1	1	4	...	...	...	...	1	3	...	...	5	11
Brain diseases	*2	1	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	1
Heart diseases	...	...	...	...	...	1	...	...	...	1	...	...	...	...	1	3	...	...	...	...	...	...	...	...	1	5
Neurotic diseases	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	1	...	...	2	1
Bowel diseases	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	4	...	...	2	4
All other diseases	...	3	1	1	...	...	2	...	...	1	...	5	...	...	1	3	5	2	‡2	1	6	13	...	...	17	29
Accident	...	1	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	4
Suicide	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Still born	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	2	...
	5	5	5	3	2	2	2	0	3	4	0	13	1	1	5	14	5	2	2	1	11	23	0	1	50	68
Totals by towns	10		8		4		2		7		13		2		19		7		3		34		1		118	
Uunder five years	.....		1		......		......		1		5		......		4		2		1		15		......		29	

REPORTERS.	TOWNS.	Population.			Temporary annual death-rate per 1,000.		
		W.	C.	Total	W	C.	Total
Dr. H. B. Weaver	Asheville	5,000	3,000	8,000	12.0	16.0	13.5
Dr. N. M. Johnson	Durham	4,000	3,500	7,500	25.0	10.0	12.8
Dr. J. A. Hodges	Fayetteville	4,500	2,500	7,000	5.3	9.6	6.9
J. E. Peterson, Mayor	Goldsboro	2,800	2,200	5,000	8.6	....	4.8
Dr. F. R. Harris	Henderson	1,785	1,715	3,500	20.2	28.0	24.0
S. Fulcher, City Clerk,	New Berne	2,500	3,500	6,000	....	44.6	26.0
Dr. J. B. Williams	Oxford	1,490	1,600	3,000	8.6	7.5	8.0
Dr. James McKee.	Raleigh	8,000	7,000	15,000	7.5	24.0	15.2
Dr. J. J. Summerell.	Salisbury	....	....	5,000	....	....	16.8
Dr. J. M. Baker	Tarboro	1,300	1,200	2,500	18.5	10.0	14.4
Dr. F. W. Potter	Wilmington	9,000	14,000	23,000	13.3	19.7	17.2
Dr. S. T. Nicholson	Washington	2,400	1,006	4,000	....	7.5	8.0

* Meningetis.

† Typho-Malarial.

‡ Old age.

MORTUARY REPORT FOR MAY, 1888.

FROM THIRTEEN TOWNS.

Causes of Death.	Asheville.		Charlotte.		Durham.		Fayetteville.		Goldsboro.		Henderson.		New Berne.		Oxford.		Raleigh.		Salisbury.		Tarboro.		Washington.		Wilmington.		Totals by Races.	
	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C
Typhoid fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Scarlet fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Malarial fever	...	...	...	...	1	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	5	2
Diphtheria	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Whooping-cough	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Measles	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	8	...	...	...	...	...	...	2	1	2	10
Pneumonia	†1	...	...	2	1	...	...	1	...	...	1	1	...	...	...	...	...	2	1	...	...	...	...	...	...	2	4	8
Consumption	...	3	...	1	1	2	...	...	...	...	...	...	...	5	...	...	1	2	...	...	...	...	...	...	3	10	5	23
Brain diseases	3	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	1	3	...	...	...	...	...	...	...	...	5	3
Heart diseases	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	1	3	...	...	...	...	...	...	1	2	3	6
Neurotic diseases	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bowel diseases	2	...	7	2	2	2	4	5	1	2	...	2	...	...	1	...	8	4	...	...	1	...	2	...	7	6	35	24
All other diseases	...	7	2	4	...	...	...	...	1	...	...	...	...	3	...	...	1	5	...	...	1	1	2	...	7	12	16	31
Accident	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Suicide	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Still-born	2	...	...	2	...	1	...	...	...	...	...	...	...	1	...	...	1	1	1	...	...	...	...	...	...	2	4	7
	8	10	9	12	5	5	7	7	2	2	1	3	1	9	2	...	13	28	2	...	2	1	4	...	23	37	79	109
Totals by towns	18		21		12		14		4		4		10		2		41		2		3		4		60		188	
Under five years	6		14		......		2		3		1		4		......		18		1		......		......		23		62	

Reporters.	Towns.	Population.			Temporary annual death-rate per 1,000.		
		W.	C.	Tot.	W.	C.	Tot.
Dr. H. B. Weaver	Asheville	6,000	4,000	10,000	16.0	30.0	21.6
Dr. J. Soar	Charlotte	6,000	5,000	11,000	18.0	28.8	22.9
Dr. N. M. Johnson	Durham	4 500	3,000	7,500	13.3	20.0	16.0
Dr J. A. Hodges	Fayetteville	4,500	2,500	7,000	18.7	33.6	24 0
J. E. Peterson, Mayor	Goldsboro	2,800	2,200	5,000	8.6	10.9	9.6
S. Fulcher, City Clerk	New Berne	2,500	3,500	6,000	9.6	30.9	20 0
Dr. F. R. Harris	Henderson	1,785	1,715	3,500	6.7	14.0	10.3
Dr. J. B. Williams	Oxford	1,400	1,600	3,000	17.1	....	8 0
Dr. James McKee	Raleigh	8,000	7,000	15,000	19.5	48.0	32.8
Dr. J. J Summerell	Salisbury	*3,000	*2,000	5,000	....	....	4.4
Dr. J. M. Baker	Tarboro	1,300	1,200	2,500	18.5	10.0	14.4
Dr. S. T. Nicholson	Washington	2,400	1,600	4 000	20 0	....	12.0
Dr. F. W. Potter	Wilmington	9,000	14,000	23,000	30.7	31.7	31.3

*Estimated.

†Bronchitis.

MORTUARY REPORT FOR JUNE, 1888.

FROM TWELVE TOWNS.

Causes of Death.	Asheville.		Charlotte.		Durham.		Fayetteville.		Goldsboro.		Henderson.		New Berne.		Oxford.		Raleigh.		Salisbury.		Tarboro.		Wilmington.		Washington.		Totals by Races.	
	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C
Typhoid fever	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	1	...	2	...	...	...	...	1	...	...	...	2	4
Scarlet fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Malarial fever	...	...	...	...	...	...	1	...	...	...	...	...	...	2	...	...	1	...	...	...	...	...	1	...	...	...	3	2
Diphtheria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	2	...
Whoop'g-cough	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Measles	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	1	...	...	...	4
Pneumonia	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1	1
Consumption	3	...	1	3	2	...	...	2	...	...	...	1	...	1	...	...	1	2	...	...	...	...	2	2	...	1	8	14
Brain diseases	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	3	1	...	...	7	1
Heart diseases	...	...	...	...	...	...	...	...	...	1	1	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	2	2
Neurotic dise'ses	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	3	7	...	...	4	8
Bowel diseases	4	1	3	3	1	3	4	5	1	...	...	1	4	4	1	...	4	6	...	...	1	...	8	15	2	...	33	39
All other dis'ses	1	7	3	4	2	5	...	...	1	...	...	...	...	5	...	...	2	4	...	...	...	...	8	12	...	...	17	35
Accident	1	...	...	...	1	...	1	...	...	1	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	4	2
Suicide	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stillborn	...	...	...	...	1	...	...	...	...	...	...	...	1	1	...	...	1	2	...	...	...	...	...	...	...	...	3	3
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	10	8	7	11	7	6	6	8	2	2	2	2	5	15	2	1	17	20	...	...	1	...	26	38	2	1	85	115
Totals by towns	18		18		13		14		4		4		20		3		37		......		1		64		3		200	
Under five years	6		8		4		3		1		1		11		1		19		......		1		44		2		123	

Reporters.	Towns.	Population.			Temporary annual death-rate per 1,000.		
		W	C.	Total	W.	C.	Total
Dr. H. B. Weaver	Asheville	6,000	4,000	10 000	20.0	24.0	21.6
Dr. J Scarr	Charlotte	6,000	5,000	11,000	14.0	24.1	19.7
Dr. Wm Johnson	Durham	4,500	3,500	8,000	12.0	20.6	19.5
Dr. J. A. Hodges	Fayetteville	4,500	2,500	7,000	16 0	38.4	24.0
J. E. Peterson, Mayor	Goldsboro	2,800	2,200	5,000	8.6	10 9	9.6
Dr. F. R. Harris	Henderson	1,785	1,715	3,500	13.4	14.0	14.0
S. Fulcher, City Clerk	New Berne	3,000	4,000	7,000	20.0	45.0	34 3
Dr. J. B. Williams	Oxford	1,400	1,600	3,000	17.0	7.5	12.0
Dr. Jas. McKee	Raleigh	8,000	7,000	15,000	25.5	34.3	29.6
Dr. J. J. Summerell	Salisbury	....	....	....	....	....	....
Dr. J. M. Baker	Tarboro	1,300	1,200	2,500	9.2	....	4.8
Dr. F. W. Potter	Wilmington	9,000	14,000	23,000	34.7	32.6	33.4
Dr. S. T. Nicholson	Washington	2,400	1,600	4.000	10.0	7.5	9.0

MORTUARY REPORT FOR JULY, 1888.

FROM ELEVEN TOWNS.

CAUSES OF DEATH.	Ahseville.		Charlotte.		Durham.		Fayetteville.		Goldsboro.		Henderson.		New Berne.		Oxford.		Raleigh.		Salisbury.†		Tarboro.		Washington.		Wilmington.*		Warrenton.		Totals by Races.	
	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c
Typhoid fever	1	...	...		...	...	1	..	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	2	...	...	3	3
Scarlet fever	...	...	...		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...
Malarial fever	...	...	..	..	...	...	...	1	...	...	...	...	1	2	...	...	...	1	...	...	...		...	...	...	2	...	...	1	6
Diphtheria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...		...	...	...	...	...	...	...	...
Whooping-cough	1	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	1	...
Measles	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	..	...	...	...	1
Pneumonia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	1	...	...	...	1
Consumption	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	1	1	3	...	...	4	5
Brain diseases	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	.	...	4	...	...	..	...	...	...	...	1	...	...	1	5
Heart diseases	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	2
Neurotic diseases	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	1	...	...	3	...	...	3	3
Bowel diseases	3	11	...	...	1	1	...	...	...	...	1	4	...	3	...	2	3	6	...	...	...	...	...	1	4	7	...	...	12	37
All other diseases	...	...	...	...	...	...	...	...	2	3	1	1	...	5	...	1	5	8	...	...	...	...	1	1	6	6	...	...	15	25
Accid't and violence	1	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	2	2
Suicide	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Still-born	...	...	...	...	...	1	.	...	...	...	...	..	1	...	...	...	...	1	...	...	...	...	2	2	..	2	...	...	3	6
	8	11	...	...	1	5	2	2	3	3	3	5	2	10	2	4	8	23	4	2	...	...	5	6	11	27	...	...	40	96
Totals by towns	19		......		6		4		6		8		12		6		31		6		......		11		38		......		136	
Under five years	14		......		5		1		2		7		8		2		17		3		......		......		19		......		78	

REPORTERS.	TOWNS.	Population.			Temporary annual death rate per 1,000.		
		W.	C.	Total	W.	C.	Total
Dr. H. B. Weaver	Asheville	6,500	3,500	10,000	14.8	37.7	22.8
Dr. J. Scarr	Charlotte	....	....	....	....	....	....
Dr. N. M. Johnson	Durham	5,500	3,000	8,000	2.2	20.0	9.0
Dr. J. A. Hodges	Fayetteville	4,500	2,000	7,000	5.3	9.6	6.8
J. E. Peterson, Mayor	Goldsboro	2,800	2,200	5,000	13.0	16.3	14.4
Dr. F. R. Harris	Henderson	1,785	1,715	3,500	20.2	35.0	27.4
S. Fulcher, City Clerk.	New Berne	3,000	4,000	7,000	4.2	30.0	18.9
Dr. J. B. Williams	Oxford	1,500	1,600	3,100	16.0	30.0	23.2
Dr. James McKee	Raleigh	8,000	7,000	15,000	12.0	39.4	24.8
Dr. J. J. Summerell	†Salisbury	....	....	....	....	....	....
Dr J. M. Baker	Tarboro	....	....	....	....	....	....
Dr. S. T. Nicholson	Washington	2,400	1,600	4,000	25.0	45.0	33.0
Dr. F. W. Potter	*Wilmington	9,000	14,000	23,000	14.7	23.0	19.8
Dr. P. J. Macon	Warrenton	....	....	....	....	....	....

*Of these, one was executed by law, and two were brought in for interment.

†Omitted in totals—diseases and population not being given.

MORTUARY REPORT FOR AUGUST, 1888.

FROM FOURTEEN TOWNS.

CAUSES OF DEATH.	Asheville.		Charlotte.		Durham.		Fayetteville.		Goldsboro.		Henderson.		New Berne.		Oxford.		Raleigh.		Salisbury.		Tarboro.		Washington.		Wilmington.		Greensboro.		Totals by Races.	
	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c
Typhoid fever	...	...	3	...	...	1	...	...	...	...	...	...	...	...	...	...	4	3	...	...	...	...	...	...	1	1	...	...	8	5
Scarlet fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.	...	...	...	.....
Malarial fever	...	...	...	...	...	2	2	...	...	...	...	...	1	2	...	...	...	...	...	..	...	...	...	1	...	...	...	...	3	5
Diptheria	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	2	...	...	...	...	1	...	1	...	...	...	...	...	4	3
Whoopi'g-cough	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	.....
Measles	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1	...	...	...	2
Pneumonia	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1
Consumption	...	...	1	...	...	...	1	1	...	...	..	...	1	3	...	1	7	1	...	...	...	...	...	...	...	8	3	3	13	18
Brain diseases	2	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	...	...	..	...	...	...	1	...	...	...	6	2
Heart diseases	1	...	1	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	...	...	5	2
Neurotic dis'es	...	...	...	...	...	...	...	...	..	..	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	2	1
Bowel diseases	2	...	1	5	1	2	1	1	1	1	...	...	...	3	1	1	2	5	...	...	...	...	...	3	2	3	...	...	11	24
All other dis'es	1	13	1	8	...	1	...	...	...	...	...	1	..	6	1	3	1	6	...	...	...	..	...	1	4	13	...	...	14	32
Accid't & vi'l'nce	...	...	...	1	...	...	...	...	...	...	...	..	...	2	...	...	...	...	...	...	...	...	...	2	...	1	1	...	1	6
Suicide	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	..	...	...	1	.....
Still-born	...	...	1	2	2	...	...	...	...	...	..	...	...	2	...	...	...	3	...	...	...	...	...	...	...	4	...	...	3	11
	6	13	10	18	3	6	5	2	1	1	1	1	2	19	4	7	14	21	3	1	1	....	1	7	12	35	4	3	72	112
Totals by towns	19		23		9		7		2		2		21		11		35		4		1		8		47		7		184	
Under 5 years	......		10		8		......		2		......		12		8		21		1		......		5		23		......		80	

REPORTER.	TOWNS.	Population.			Temporary annual death-rate per 1,000.		
		W.	C.	Total	W.	C.	Total
Dr. H. B. Weaver	Asheville	7,000	3,300	10,300	9.0	48.3	22.8
Dr. J. Scarr	Charlotte	6,000	5,000	11,000	18.9	31.2	24.0
Dr. N. M. Johnson	Durham	5,000	3,000	8,000	7.2	24.0	13.4
Dr. J. A. Hodges	Fayetteville	4,500	2,500	7,000	13.3	9.6	12.0
J. E. Peterson, Mayor	Goldsboro	2,000	2,800	5,000	3.6	4.8	48.0
Dr. F. R. Harris	Henderson	1,785	1,715	3,500	6.0	6.0	6.8
S. Fulcher, City Clerk	New Berne	3,000	4,000	7,000	15.9	57.0	39.3
Dr. J. B. Williams	Oxford	1,500	1,700	3,200	31.2	34.8	33.6
Dr. James McKee	Raleigh	8,000	7,000	15,000	13.4	36.0	24.0
Dr. J. J. Sumerell	Salisbury	....	....	4,159	....	....	11.4
Dr. J. M. Baker	Tarboro	1,100	1,400	2,500	21.7	....	96.0
Dr. S. T. Nicholson	Washington	2,400	1,600	4,000	4.9	5.16	24.0
Dr. F. W. Potter	Wilmington	9,000	14,000	23,000	15.9	28.0	22.8
Dr. B. M. Tate	Greensboro	....	....	5,500	....	....	14.4

MORTUARY REPORT FOR SEPTEMBER, 1888.

FROM FOURTEEN TOWNS.

CAUSES OF DEATH	Asheville.		Charlotte.		Durham.		Fayetteville.		Goldsboro.		New Berne.		Raleigh.		Tarboro.		Washington.		Wilmington.		Henderson.		Salisbury.		Greensboro.		Oxford.		Totals by Races.	
	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C
Typh'id fev'r	...	1	2	1	..	...	...	...	...	...	...	...		...	...	...	1	...	...	2	...	...	1	...	...	...	...	...	4	4
Scarlet fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Malarial fev.	...	..	...	1	1	1	...	1	...	...	1	5	...	...	...	...	...	1	...	4	...	...	...	...	...	...	1	...	3	12
Diphtheria...	...	...	1	...	1	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2
Wh'p'g c'gh,	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	2
Measles	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pneumonia	...	...	...	1	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	3
Consumpti'n	2	...	2	2	..	1	...	1	...	1	...	1	1	1	...	...	...	...	1	4	..	1	...	...	4	...	1	...	11	10
Brain dis	...	...	...	2	...	...	...	...	...	...	1	...		1	...	...	2	...	...	1	...	...	...	...	1	...	1	...	7	4
Heart dis	...	...	...	1	...	...	...	...	...	...	...	2	2	...	...	...	...	...	...	1	...	...	...	...	1	...	1	...	4	4
Neurotic dis	...	...	...	1	...	...	1	...	...	...	...	...	...	1	...	...	...	...	...	4	...	...	...	...	...	1	1	1	2	8
Bowel dis.....	1	...	...	...	3		...	...		1	2	10	5	2	...	...	...	1	...	...	...	2	2	...	...	...	...	...	14	17
All other dis.	...	7	1	2	...	2	...	...	...	...	2	4	3	10	...	...	...	2	4	8	1	...	...	...	...	...	...	1	11	36
Accid'nt and violence.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	...	...	1	......
Suicide	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Still born......	1	...	...	4	...	1	...	2	...	..	...	1	1	2	..	..	...	...	1	3	...	...	...	...	...	4	...	...	3	17
	4	8	6	15	5	6	1	1	1	2	6	25	15	18	1	..	3	5	6	28	1	4	4	..	6	5	5	2	64	119
Tot. by towns	12		21		11		5		3		31		33		1		8		34		5		4		11		7		183	
Under 5 y'ars	8		10		8		2		2		21		21		......		3		17		3		2		......		1		114	

REPORTERS.	TOWNS.	Population.			Temporary annual death-rate per 1,000.		
		W	C.	Total	W.	C.	Tot.
Dr. H. B. Weaver..............	Asheville................	5,000	3,000	8,000	9.0	32.0	20.5
Dr. Scarr..............................	Charlotte..................	6,000	5,000	11,000	12.0	38.0	25.0
Dr. N. M. Johnson.......	Durham...................	4,500	3,000	7,500	13,3	2 .0	18.6
Dr J. A. Hodges	Fayetteville............	4,500	2,500	7,000	2.6	19.2	10.9
J. E. Peterson, Mayor.......	Goldsboro...............	2,800	2,200	5,000	4.2	10.9	7.5
S. Fulcher, City Clerk......	New Berne...............	2,000	3,000	5,000	3.6	12.4	8.0
Dr. James McKee..............	Raleigh	8,000	7,000	15,000	22.5	27.4	21.9
Dr. J. M. Baker................	Tarboro...................	1,300	1,200	2,500	9.2	....	9.2
Dr. S. T. Nicholson......	Washington............	2,400	1,600	4,000	15.0	37.5	26.5
Dr. F. W. Potter.......	Wilmington............	9,000	14,000	23,000	7.9	24.0	15.9
Dr. F. R. Harris,.......	Henderson	1,785	1,715	3,500	6.7	27.9	17.3
Dr. J J. Summerell............	Salisbury	....	....	5,000	....	....	9.6
Dr. R. W. Tate.,..........	Greensboro.............	4,000	2,000	6,000	....	....	12.0
Dr. J. B Williams....... ...	Oxford......................	1,500	1,600	3,100	39.9	15.0	27.4

MORTUARY REPORT FOR OCTOBER, 1888.

FROM THIRTEEN TOWNS.

CAUSES OF DEATH.	Durham.		Sta'esville.		Charlotte		Fayetteville.		Goldsboro.		New Berne.		Raleigh.		Tarboro		Washington.		Wilmington.		Henderson.		Salisbury.		Greensboro.		Oxford.		Totals by Races.	
	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c
Typhoid fever....	1	...	...	...	1	1	...	...	...	...	...	...	3	1	...	...	...	...	...	1	...	1	...	...	...	...	...	1	5	6
Scarlet fever......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Malarial fever....	...	...	...	...	...	1	...	1	...	...	1	4	...	...	...	...	...	...	2	7	...	...	...	...	...	...	...	...	3	13
Diphtheria.........	...	...	2	1	...	...	...	...	...	...	1	...	2	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	6	3
Whoopi'g-cough	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Measles..............	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pneumonia........	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1	...	1	...	...	...	...	1	1	2	4
Consumption.....	...	...	...	...	1	1	1	2	...	1	2	1	1	2	...	...	...	...	1	3	...	...	...	...	...	...	...	...	6	10
Brain diseases...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	3	...	...	...	...	...	...	2	...	1	5
Heart diseases..	...	...	1	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	1	...	1	...	...	...	...	...	...	1	3	4
Neurotic dis'ses	...	1	1	...	...	...	1	1	...	...	...	...	2	...	...	...	...	...	1	1	...	...	...	...	...	...	...	1	5	4
Bowel diseases...	1	...	...	...	...	...	...	1	1	1	2	2	3	2	...	...	...	...	1	2	1	...	2	1	...	...	...	2	13	11
All other dis'ses	1	2	...	...	6	8	1	...	1	...	...	4	1	5	...	...	...	...	5	11	...	2	...	...	...	...	...	...	15	32
Acci'nt & v'l'nce	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Suicide...............	...	...	1	...	...	...	2	...	1	1	1	1	2	1	..	1	...	...	1	2	...	1	...	...	...	...	...	...	9	7
Still-born...........	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
	4	3	6	1	11	11	5	5	3	3	7	14	15	12	..	1	....	....	13	32	2	5	2	1	...	...	3	6	70	99
Totals by towns.	7		7		22		10		6		21		27		1		......		45		7		3		......		9		169	
Under 5 years.....	2		......		12		2		2		.....		8		1		......		26		4		2		.....		3		54	

REPORTER.	TOWNS.	Population.			Temporary annual death-rate per 1,000.		
		W.	C.	Total	W.	C.	Total
Dr. N. M. Johnson..............	Durham...................	4,500	3,000	7,500	13.3	24 0	18.6
Dr. M. W. Hill..	Statesville..............	....	....	3,500	....	....	....
Dr. J. Scarr........................	Charlotte...............	4,500	3,000	7,500	9.0	32.0	20.5
Dr. J. A. Hodges...................	Fayetteville..............	4,500	2,500	7,000	2.6	19 2	10 9
J. E. Peterson, Mayor..........	Goldsboro................	2,800	2,200	5,000	4 2	10.7	7.55
S. Fulcher, City Clerk..........	New Berne................	2,000	3,000	5,000	3.6	12.4	8.0
Dr. James McKee..................	Raleigh.....................	8,000	7,000	15,000	22.5	27 4	21.9
Dr. J. M. Baker.....................	Tarboro....................	1,300	1,200	2.500	9.2	....	9.2
Dr. S. T. Nicholson..............	Washington..............	2,400	1,600	4 000	15.0	37.5	26.5
Dr. F. W. Potter...................	Wilmington..............	9.000	14,000	23,000	7 9	24.0	15.9
Dr. F R. Harris.........	Henderson................	1,785	1,715	3,500	6.7	27.9	17.3
Dr. J. J. Summerell..............	Salisbury..	....	....	5,000	....	....	9.6
Dr. R. W. Tate......................	Greensboro..............	4,000	2,000	6,000	....	....	12.0
Dr. J. B Williams.......	Oxford	1,500	1,600	3,100	29.0	15.0	27 4

MORTUARY REPORT FOR NOVEMBER, 1888.

FROM FOURTEEN TOWNS.

CAUSES OF DEATH.	Asheville.		Charlotte.		Durham.		Goldsboro.		Greensboro.		Henderson.		Fayetteville.		Oxford.		Raleigh.		New Berne.		Salisbury.		Tarboro.		Washington.		Wilmington.		Totals by Races.	
	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C
Typhoid fev'r		...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	..	...	...	...	...	...	..	...	....	....	....	....	1
Scarlet fever..	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	....	....	....	....	....
Malarial fever	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	..	...	...	...	....	....	..	1	1
Diphtheria....	...	...	1	...	1	...	...	...	...	...	...	...	...	...	..	...	..	...	1	...	...	...	...	...	...	....	....	....	8	....
Wh'p'g-co'gh.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	....	....	....	1	....
Measles..........	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....	....	....	....	....
Pneumonia ...	..	...	...	1	...	...	...	...	...	...	...	...	...	2	...	1	...	1	...	...	...	...	1	...	...	....	....	2	7	1
Consumption	...	...	2	1	...	1	...	...	2	3	...	...	1	1	...	...	...	1	...	3	...	...	...	...	...	....	....	2	5	12
Brain dis'ses..	...	...	...	..	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	..	...	...	..	...	....	....	..	2	....
Heart dis'ses..	...	...	...	1	1	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	1	..	1	....	....	3	5	4
Neurotic dis..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....	....	3	....	3
Bowel dis'es...	...	...	1	...	1	...	...	...	...	...	...	...	...	1	...	...	...	2	1	...	...	...	...	...	1	....	2	1	5	5
All other dis.	1	...	3	2	...	1	...	...	...	...	...	1	1	..	2	...	1	5	1	3	2	...	1	2	1	....	5	10	18	24
Accid't& vi'ce	...	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	....	....	....	....	2
Suicide	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	....	....	....	1	....
Still-born	...	7	...	1	...	...	1	...	...	...	...	2	...	...	...	...	1	3	...	1	...	...	...	...	...	....	...	6	8	23
	1	7	7	10	5	2	1	...	4	3	...	4	3	5	2	1	5	12	3	8	2	...	3	2	3	....	7	27	41	76
Tot'ls by to'ns	8		17		7		1		7		4		8		3		17		11		2		5		3		34		117	
Under 5 years	7		11		4		1		......		2		1		......		9		6		......		......		1		6		47	

REPORTERS.	TOWNS.	Population.			Temporary annual death-rate per 1,000.		
		W.	C.	Total	W.	C.	Total
Dr. H. B. Weaver..............	Asheville................	7,000	3,000	10,000	1.6	27.6	9.6
Dr. J. Scarr........................	Charlotte	4,500	3,000	7,500	12.1	24.0	15.1
Dr. N. M. Johnson............	Durham	4,500	3,000	7,500	6.0	12.0	9.6
Dr. J. A. Hodges..............	Fayetteville	4,500	2,500	7,000	7.2	24.0	12 1
J. E. Peterson.....................	Goldsboro	2,800	2,200	5,000	7.2	12.8	12.1
Dr. R. W. Tate	Greensboro............	4,000	2,000	6,000	12.0	12.6	12.1
Dr. F. R. Harris.................	Henderson.............	1,785	1,715	3,500	12.1	....	24.3
S. Fulcher, City Clerk.......	New Berne	2,000	3,000	5,000	12.1	24.0	18.0
Dr. J. B. Williams.............	Oxford	1,500	1,600	3,100	12.6	6.0	9.6
Dr. Jas. McKee.......	Raleigh	8,000	7,000	15,000	12 1	7.2	12.8
Dr. J. M. Baker	Tarboro..................	1,300	1,200	2,500	22.6	19.2	24.0
Dr. J. J. Summerell..	Salisbury	....	....	5,000	....	....	9.6
Dr. S. T. Nicholson...........	Washington	2,400	1,600	4,000	12.6	....	8.6
Dr. F. W. Potter................	Wilmington...........	9,000	14,000	23,000	7.2	13.0	11.0

MORTUARY REPORT FOR DECEMBER, 1888.

FROM FOURTEEN TOWNS.

CAUSES OF DEATH.	Goldsboro.		Raleigh.		Durham.		Fayetteville.		Washington.		Tarboro.*		New Berne.		Henderson.		Statesville.		Asheville.		Oxford.*		Greensboro.		Wilmington.		Charlotte.		Totals by Races.	
	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c	w	c
Typh'd fever	...	...	1	...	2	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	2	5	1	9	3
Scarlet fever	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mal'ri'l fever	...	...	...	...	...	2	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	4
Diphtheria...	...	...	1	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	4	1
Wh'p'g-co'gh	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Measles.........	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pneumonia..	...	1	...	2	...	...	...	...	...	1	...	...	1	4	...	1	...	1	...	1	...	...	...	...	2	1	1	..	4	12
Consumpti'n	...	1	1	4	...	...	1	2	...	...	...	...	1	1	...	1	...	...	...	...	...	...	2	2	...	2	...	1	5	14
Brain dis'ses	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
H'art dis'ses..	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	1	3	1
Neurotic fev.	...	...	...	...	1	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1
Bowel dis'ses	...	...	...	1	...	2	...	...	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	1	7
All other dis.	1	1	2	5	...	...	1	...	1	...	...	...	2	4	1	...	...	...	2	4	...	...	...	...	4	10	3	...	17	24
Accident and violence.....	1	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1
Suicide..........	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Still-born	...	...	...	2	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	2	2	...	1	2	8
	3	3	5	15	3	5	3	5	2	4	...	...	7	13	2	2	...	1	2	5	.	...	3	2	10	19	9	5	50	77
Tot. by towns	6		20		8		8		6		.....		20		4		1		7		......		5		29		14		127	
Under 5 y'rs.	2		5		4				3		......		7		1		.....		6		......		.....		10		3			

REPORTERS.	TOWNS.	Population.			Temporary annual death-rate per 1,000.		
		W.	C.	Tot.	W.	C.	Tot.
J. E. Peterson, Mayor........	Goldsboro	2,800	2,200	5,000	12.0	12.3	12.2
Dr. James McKee...............	Raleigh.....................	8,000	7,000	15,000	7.2	25.2	15.6
Dr N. M. Johnson.	Durham....................	4,500	3,500	8,000	7.2	18.8	12.0
Dr. J. A. Hodges	Fayetteville	4,500	2,500	7,000	7.2	24.0	12.1
Dr. S. T. Nicholson............	Washington...........	3,400	1,600	4,000	10.0	30.0	28.0
Dr. J. M. Baker	*Tarboro..................	....	....	....	....	....	....
S. Fulcher, City Clerk........	New Berne............	3,000	4,000	7,000	17.6	38.4	33.6
Dr. F. R. Harris.,.........	Henderson	1,785	1,715	3,500	13.2	13.2	13.2
Dr. M. W. Hill.....................	Statesville**	....	....	....	....	....	2.5
Dr. H. B. Weaver................	Asheville................	7,000	3,000	10,000	3.4	19.2	8.4
Dr. J. B. Williams.......	Oxford*....................	1,500	1,600	3,100	....	....	....
Dr. R. W. Tate	Greensboro......	4,000	2,000	6,000	9.0	12.0	9.6
Dr. F. W. Potter.................	Wilmington	9,000	14,000	23,000	12.1	15.6	14.5
Dr. J. Scarr........	Charlotte	4,500	3,000	7,500	12.0	12.7	12.9

*No deaths.

**Population not given.

TEMPERATURE REPORT FOR JANUARY, 1887.

STATIONS.	TEMPERATURE.											NO. DAYS.					
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range	Greatest daily range.	Date	Least daily range.	Date.	Clear.	Cloudy.	Fair.	On which rain fell, including hail, snow and sleet.	Total rain-fall, including hail, snow and sleet, (in inches).	Prevailing wind.
Smithville	...	...	...	...	...	...	...	...	...	...	...	..	..	..	...	...	...
Hatteras	44.7	65.6	23	19 8	19	45 8	15.3	28.8	...	5.9	..	11	9	11	5	6.09	N.
Knoxville, Tenn	37.5	68.8	31	5.4	3	63.4	20.7	36.5	...	7.4	...	13	4	14	10	3.99	S. W.
Charlotte	38 2	68.9	31	8.2	4	60.7	17.8	28.1	19	4.9	5	9	5	17	12	2.39	S. W.
Fort Macon	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...
Lynchburg, Va	35.4	65.4	23	6.1	4	59.3	18.4	29.0	...	6 8	...	13	9	9	11	2.64	S. W.
Wake Forest	39.8	71.1	23	7.0	11	64.0	...	...	...	...	...	...	...	...	9	3.01	S. W.
Kitty Hawk	41 0	69.7	22	14.8	19	54.9	...	38.1	5	4.4	1	..	...	...	8	2.55	S. W.
Wilmington	44.2	73.0	22	14.6	19	58 4	19.3	34.6	28	6.8	c	11	6	14	13	3.30	S. W.
Chapel Hill	39.1	72.0	a	8.0	b	64.0	17.6	37.0	16	4.0	5	17	9	5	6	2.81	S. W.
Average	40.0	69 3	...	10.5	...	58.8	18.2	33 2	...	5 7	...	12	7	12	12	3.35	S. W.

a, 21st and 23d; b, 4th, 11th and 19th; c, 6th and 8th.

TEMPERATURE REPORT FOR FEBRUARY, 1787.

STATIONS.	TEMPERATURE.											NO. DAYS.					
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.	Total rain-fall, including hail, snow and sleet, (in inches).	Prevailing wind.
Smithville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hatteras	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Knoxville, Tenn	49.6	72.8	10	21.6	27	51.2	17.4	26.8	...	7 0	...	5	11	12	16	6.67	S. W.
Charlotte	48.9	70.8	11	25.7	13	45.1	17.4	27 5	...	5.3	...	3	12	13	16	4 81	S. W.
Fort Macon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lynchburg, Va	43.7	72.2	11	20.0	14	52.2	18 7	29.1	...	5.5	...	2	12	14	11	3.51	S. W.
Wake Forest	49.8	74.7	1	20.2	14	54.5	...	...	...	...	...	...	...	...	12	4.39	S. W.
Kitty Hawk	50.6	75 4	11	29.1	28	46.2	...	34.5	12	5.9	1	...	..	...	10	4.08	S. W.
Wilmington	54.7	75.0	9	27.2	14	47.8	19 1	31.3	27	7.1	23	8	11	9	13	1.61	S. W.
Chapel Hill	48.1	79.0	1	22.0	14	57.0	20.8	36.0	1	6 0	21	8	3	17	13	4.62	S. W.
Average	49.3	74.3	...	23.7	...	50 7	18 7	30 9	...	6.1	...	10	10	13	13	4.24	S. W.

TEMPERATURE REPORT FOR MARCH, 1887.

STATIONS.	Teperature.											No. Days.				Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.		
Smithville	.....	.....	..	......	...	......	.....	......	...	.....	...	...	...	...	....	....	....
Hatteras	.....	.....	...	......	...	......	.....	......	...	.....	...	...	...	...	....	....	....
Knoxville, Tenn	47.9	75.6	26	21.6	29	54.0	20.2	37.2	...	7.	....	12	8	11	11	3.97	S. W.
Charlotte	47.7	79.7	2	26.8	18	52.9	22.3	36.4	...	6.0	...	12	11	8	8	2.93	S. W.
Fort Macon	.....	.....	...	......	...	......	.....	......	...	.....	..	...	...	...	....	....	....
Lynchburg, Va	43.5	80.6	2	23.5	30	57.1	20.1	47.6	...	3.9	...	8	15	8	9	2.58	N.W.
Wake Forest	47.9	80.0	2	20.3	30	59..	......	....	...	4.6	...	...	...	...	7	4.45	N.W.
Kitty Hawk	49.3	74.2	2	26.0	30	48.2	22.4	36.5	2	4.6	26	..	...	..	11	4.60	N. E.
Wilmington	52.1	81.9	3	27.7	30	54.2	21.4	34.6	1	10.3	5	15	11	5	6	1.48	S. W.
Chapel Hill	43.7	83.0	2	26.0	30	57.0	22.4	40.0	2	3.0	5	16	8	7	7	3.93	W.
Average	47.4	79.3	...	24.6	..	54.7	21.5	38.5	...	5.8	...	13	10	8	8	3.42	S. W.

TEMPERATURE REPORT FOR APRIL, 1887.

STATIONS.	Temperature.											No. Days.				Total rain-fall, including rain, snow and sleet (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.		
Statesville	56.9	87.0	...	30.	...	......	......	......	...	.....	...	...	...	...	9	2.72	N.W.
Smithville	.....	.....	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Hatteras	57.0	75.6	23	36.7	2	38.9	14.1	23.3	19	7.2	14	12	14	4	9	2.71	N. E.
Knoxville, Tenn	59.0	88.7	13	29.1	6	59.6	24.4	39.0	12	11.5	29	14	12	4	10	4.33	S. W.
Charlotte	59.3	89.3	13	32.1	2	57.2	23.4	36.3	8	6.6	1	15	11	4	9	1.84	S. W.
Fort Macon	....	.....	..	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Lynchburg, Va	53.5	85.4	12	30.9	3	54.5	22.7	41.2	..	5.0	...	8	15	7	12	3.29	S. W.
Wake Forest	56.4	87.0	19	27.3	6	59 7	......	......	..	......	...	...	...	...	8	1.85	S. W.
Kitty Hawk	.....	.....	.	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Wilmington	59.9	85.7	12	32.9	2	52.8	20.5	33.6	13	13.3	23	18	8	4	11	3.96	S.
Chapel Hill	58.3	91.0	2	28.0	6	63.0	26.3	41.0	4	6.0	1	18	6	6	4	2.56	S. W.
Average	57.5	86.2	...	30.9	...	55.1	21.9	35.7	...	8.3	...	14	11	5	9	2.91	S. W.

TEMPERATURE REPORT FOR MAY, 1887.

STATIONS.	TEMPERATURE.											NO. DAYS.				Total rain-fall, including hail, snow and sleet, (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.		
Hatteras	69.1	78.2	13	55.3	18	22.9	10 0	20.1	18	6 2	16	16	10	5	10	2.58	S.
Knoxville, Tenn	70.2	87.9	a	52.3	1	35.6	22.4	35 5	1	10.8	6	11	16	4	12	4.79	S. W.
Charlotte	70.6	90.6	18	50.4	15	40.5	19.8	30.3	2	8.1	31	6	17	8	16	3.64	E.
Fort Macon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lynchburg, Va	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kitty Hawk	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wilmington	71.1	87.5	18	47.0	15	40.5	18.2	38.5	17	7.4	23	11	14	6	14	5 62	S. W.
Chapel Hill	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wake Forest	70.7	90.2	18	43.2	15	47.0	...	...	...	...	...	...	...	...	13	2.58	S. E.
Average	70.3	87.3	...	49.6	...	37.3	17.6	28.6	...	8.1	...	11	14	6	13	3.84	S.

TEMPERATURE REPORT FOR JUNE, 1887.

STATIONS.	TEMPERATURE.											NO. DAYS.				Total rain-fall, including hail, snow and sleet, (in inches).	Prevailing wind.
	Meau monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair	Cloudy.	On which rain fell, including hail, snow and sleet.		
Hatteras	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Knoxville, Tenn	72.4	82 8	19	60 5	12	22.3	8.3	13.1	10	4 4	25	11	11	8	9	3.41	N.
Charlotte	74.0	96.0	20	51.4	2	44.6	22.4	30.1	13	10.5	22	16	14	...	6	3 07	S. W.
Fort Macon	75.0	101.9	20	52.8	12	49.1	24.9	28 5	19	14.4	11	9	15	6	10	4.44	E.
Lynchburg, Va	72.8	97.7	20	49.3	12	48 4	22.3	33.3	3	10.0	...	11	13	6	11	3.65	N. E.
Wake Forest	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kitty Hawk	72.7	97 2	17	56.3	2	44.9	17.2	34.2	17	6.0	12	9	8	11	6	4.31	...
Wilmington	75.6	87.9	20	53.0	13	44.9	17.5	31.0	14	7.7	23	11	11	8	13	6.41	S. W.
Chapel Hill	70.7	93.0	a	45.0	b	48.0	21.6	39 0	1	6.0	31	12	10	8	9	6.59	W
Average	73.3	95.2	...	52.6	...	42.6	19.2	29.9	...	8.4	...	13	11	8	9	4.55	...

a, 18th and 19th; b, 1st and 15th.

TEMPERATURE REPORT FOR JULY, 1887.

STATIONS.	TEMPERATURE.											NO. DAYS.					
	Mean Monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.	Total rain fall, including hail, snow and sleet (in inches).	Prevailing wind.
Hatteras	72.4	82.5	19	60.5	12	22.3	8.3	13.1	10	4.4	25	11	11	8	9	3.42	N.
Knoxville, Tenn.	74.0	96.0	20	51.4	2	44.6	22.4	30.1	13	10.5	22	16	14	...	6	3.07	S. W.
Charlotte	75.0	101.9	20	52.8	12	49.1	21.9	28.5	19	14.4	11	9	15	6	10	4.44	E.
Lynchburg	72.8	97.7	20	49.3	12	48.4	22.3	33.3	3	10.0	...	11	13	6	11	3.65	N. E.
Kitty Hawk	72.7	97.2	17	56.3	2	44.9	17.2	34.2	7	6.0	12	9	8	11	6	4.31	...
Wilmington	75.6	97.9	20	53.0	13	44.9	17.5	31.0	14	7.7	23	11	11	8	13	6.41	S. W.
Chapel Hill	70.7	93.0	a	15.0	6	48.0	24.6	39.0	1	6.0	31	12	10	8	9	6.50	W.
Smithville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Fort Macon	...	...		...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average	73.3	95.2	...	52.6	...	42.6	19.2	29.9	...	8.4	...	...	...	...	...	...	...

TEMPERATURE REPORT FOR AUGUST, 1887.

STATIONS.	TEMPERATURE.											NO. DAYS.					
	Mean Monthly.	Highest	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.	Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
Knoxville, Tenn.	**75.0**	94.1	5	53.9	31	40.2	19.2	25.4	12	6.8	1	13	14	4	13	4.48	N. E.
Charlotte	**74.7**	95.1	6	52.8	31	42.3	19.4	27.3	12	7.2	27	8	11	12	16	9.92	N. E.
Lynchburg, Va.	**74.0**	95.2	11	49.8	30	45.4	19.8	29.3	10	7.3	2	12	11	8	13	4.73	S.
Wilmington	**77.4**	95.0	13	55.6	30	39.4	14.4	22.0	31	5.6	24	11	16	4	14	9.88	S. W.
Southport	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hatteras	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Fort Macon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wake Forest	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kitty Hawk	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chapel Hill	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average	**75.3**	94.8	...	53.0	...	41.8	18.2	26.0	...	6.7	...	11	13	7	14	7.03	S. & N

TEMPERATURE REPORT FOR SEPTEMBER, 1887.

STATIONS.	TEMPERATURE.												NO. DAYS.				Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.			
Hatteras..............	70.9	84.4	14	53.3	25	31.1	10.1	16.8	27	4.8	15	19	9	2	....		.80	N. E.
Knoxville, Tenn...	69 9	91.0	14	37.8	2	56.2	22.8	31.2	...	7.4	...	15	10	5	....		....	S. W.
Charlotte..............	69.1	98.0	14	36.0	25	62.0	27.6	38.0	3	1.2	30	16	9	5	4		1.39	w sw
Lynchburg, Va.....	66.7	96.9	14	36.8	25	60.1	21.4	34 7	10	7.1	28	9	11	10	9		3.11	N. E.
Wake Forest.........	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....		....	....
Kitty Hawk	70 4	94.1	18	43.6	26	50.5	18.1	32.2	4	6.4	14	...	...	...	....		....	....
Wilmington..........	71.2	91.0	14	42.3	25	48.7	17.9	23.3	10	11.0	28	12	15	3	7		1.43	S. W.
Chapel Hill............	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....		....	....
Average..................	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....		....	....

TEMPERATURE REPORT FOR OCTOBER, 1887.

STATIONS.	TEMPERATURE.												NO. DAYS.				Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.			
Hatteras..............	37.5	79.6	10	42.1	31	37.5	11.0	24.8	31	5.3	27	16	3	12	12		11.07	N.
Knoxville, Tenn...	54.1	82.0	9	27 9	31	35.7	22.4	35.7	....	4.6	...	15	9	7	8		2.70	S. W.
Charlotte..............	38.0	83.9	10	35.5	30	48.4	18.5	39.6	...	5.8	...	15	5	11	14		8.04	N. E.
Fort Macon	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....		....	....
Lynchburg, Va....	50.2	88.2	10	30.0	16	58.2	21.0	36.2	8	7.1	26	13	8	10	10		3.81	W.
Chapel Hill..........	57.0	90.0	10	34.0	16	58.0	19.9	40.0	13	4.0	27	16	3	12	12		11.21	W.
Kitty Hawk.... ...	63.4	87.6	3	45.5	12	42.1	18.1	30.3	...	8.1	...	...	...	...	8		4.87	....
Wilmington..........	62.7	85.3	3	34.8	31	50.5	18.6	29.2	16	5.4	29	14	5	12	10		6 53	N.W.
Wake Forest.........	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....		....	....
Average..................	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....		....	....

TEMPERATURE REPORT FOR NOVEMBER, 1887.

STATIONS.	TEMPERATURE.												No. DAYS.				Total rainfall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean monthly.		Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.			
Hatteras	54.2	72.8	26	38.6	22	34.2	14.7	25.3	28	7.8	9	15	7	8	8		2.87	N.
Knoxville, Tenn.	47.5	73.0	26	14.7	21	58.3	23.0	36.0	...	7.4	...	14	12	...	12		.93	N. E.
Charlotte	50.1	73.9	26	21.5	21	52.4	21.5	34.2	16	7.9	18	16	10	4	3		.51	S. W.
Fort Macon	......	......	...	......	...	......	......	......	...	......	...	...	...	...	......		......	......
Lynchburg, Va.	46.3	75.3	4	22.4	30	52.9	22.4	40.9	3	4.7	6	14	11	5	6		1.01	S. W.
Chapel Hill	47.9	76.0	27	25.0	21	51.0	24.3	38.0	3	6.0	19	17	5	8	2		.85	W SW
Kitty Hawk	51.8	72.5	18	31.2	22	46.3	21.1	28.6	24	10.1	9	...	...	...	3		1.03	......
Wilmington	47.8	73.8	27	26.0	21	47.8	21.9	32.5	24	13.2	29	19	9	2	6		1.04	N.
Wake Forest	......	...	...	......	...	......	....	......	...	......	..	...	...	...	......		......	......
Average	......	......	...	......	...	......	....		...	......	...	...	...	...	......		......	......

TEMPERATURE REPORT FOR DECEMBER, 1887.

STATIONS.	TEMPERATURE.												No. DAYS.				Total rainfall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean monthly range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.			
Hatteras	47.9	64.9	11	33.8	30	31.1	14.0	29.7	31	7.2	10	6	13	12	15		6.96	N.
Knoxville, Tenn	39.0	64.0	4	13.6	29	50.4	14.6	27.7	...	4.8	...	6	9	16	18		3.49	......
Charlotte	42.1	62.8	4	16.3	30	46.5	15.8	26.5	...	6.5	...	5	14	12	13		4.94	W.
Fort Macon	......	......	...	......	...	......	......	......	...	......	...	...	..	...	......		......	......
Lynchburg, Va	37.9	62.4	11	12.9	30	49.5	15.4	31.4	7	5.3	28	8	12	11	14		4.28	N W.
Chapel Hill	42.0	68.0	4	14.0	30	54.0	18.6	36.0	7	4.0	8	5	14	12	6		6.19	W.
Kitty Hawk	46.6	66.0	15	18.7	30	47.3	18.2	33.8	18	5.9	25	...	...	...	......		4.14	......
Wilmington	48.1	67.0	15	19.0	30	48.0	17.5	28.6	3	5.3	10	9	11	11	13		4.41	N. E.
Wake Forest	......	......	...	......	...	......	......	......	...	......	...	...	...		......		......	......
Average	......	......	...	......	...	......	......	......	...	......	...	...	...	.	......		......	......

TEMPERATURE REPORT FOR JANUARY, 1888.

Stations.	Temperature.											No. Days.				Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean Monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain-fell, including hail, snow and sleet.		
Hatteras	41.7	69.0	2	22.5	25	46.5	14.8	28.8	2	7.0	*	8	12	11	13	4.85	N.
Knoxville, Tenn.	40.0	70.0	6	12.0	19	58.0	15.0	29.0	...	3.0	...	3	17	11	17	6.61	W.
Charlotte	42.0	72.8	7	17.2	19	55.6	19.8	34.7	1	8.1	17	8	12	11	14	4.38	S. W.
Fort Macon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lynchburg, Va.	35.6	73.7	7	14.0	12	59.7	17.5	36.1	30	8.6	23	8	15	8	10	2.99	**
Chapel Hill	39.4	75.0	†	16.0	19	59.0	18.5	34.0	4	6.0	3	9	8	14	7	3.37	‡
Kitty Hawk	44.6	70.5	8	17.3	28	53.2	18.5	30.4	16	4.3	22	...	...	...	10	5.65	N.
Wilmington	46.5	75.1	7	20.0	19	55.1	19.5	32.5	30	8.5	17	13	9	9	17	2.21	N. W.
Wake Forest	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

*7 and 22. †7 and 8. **N. W. and S. W. ‡W. and S. W.

TEMPERATURE REPORT FOR FEBRUARY, 1888.

Stations.	Temperature.											No. Days.				Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean Monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain-fell, including hail, snow and sleet.		
Hatteras	46.3	65.5	20	26.8	16	38.7	12.5	21.3	17	4.3	23	9	14	6	11	3.83	N.
Knoxville, Tenn.	45.3	67.0	18	9.1	28	57.9	17.0	34.3	...	6.0	...	6	9	14	13	3.75	W.
Charlotte	46.1	70.0	18	15.5	28	54.5	18.2	32.6	17	10.0	5	6	13	10	10	4.26	‡
Fort Macon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lynchburg, Va.	40.5	66.0	18	11.3	28	54.7	18.4	38.7	14	5.5	4	7	10	12	12	3.59	**
Chapel Hill	47.2	72.0	18	14.0	28	58.0	20.1	39.0	29	5.0	12	11	5	13	7	4.01	...
Kitty Hawk	46.1	72.1	25	22.5	28	49.6	17.2	30.9	29	7.2	11	...	...	...	...	4.54	W.
Wilmington	49.6	72.0	18	24.6	*	47.4	19.0	33.3	††	5.1	21	10	13	6	12	6.22	N. E.
Wake Forest	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

*16 and 28. ††14 and 17. ‡S. W. and S. **N. E. and N. W.

TEMPERATURE REPORT FOR MARCH, 1888.

STATIONS.	TEMPERATURE.											No. DAYS.				Total rain-fall, including hail, snow and sleet, (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.		
Hatteras	48.0	69.0	29	25.8	23	43.2	13 1	20.2	29	2 3	28	12	12	7	10	5.07	N. E.
Knoxville, Tenn.	46.9	76.4	20	19.0	23	57.4	20.2	37.5	...	7.5	...	9	9	13	10	4.22	N.
Charlotte	49.3	79.3	31	20,0	23	59.3	22.4	35.3	...	5.2	...	11	12	8	11	6.22	S. W. N,W.
Fort Macon	...	...	...	...	...	...	...	...	...	...	...	...	12	...	...	...	...
Lynchburg, Va.	42.7	80.1	31	16.5	23	63.6	21.6	37.1	16	6.4	25	11	11	9	11	5.25	N.W.
Chapel Hill	47.3	78 0	31	20.0	23	58 0	21.3	36 0	15	9.0	a	10	8	13	8	8 73	S. W.
Kitty Hawk	48.5	75.8	31	21.6	14	54.2	20.5	32.9	29	10.1	21	...	...	...	10	6.75	...
Wilmington	51.4	76,5	29	24.0	23	51.1	19.7	29.5	1	8.2	27	13	10	8	11	4.74	S. W.
Wake Forest	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

a, 5th, 7th and 26th.

TEMPERATURE REPORT FOR APRIL, 1888.

STATIONS.	TEMPERATURE.											No. DAYS.				Total rain-fall, including hail, snow and sleet, (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.		
Hatteras	57.3	74.8	29	41.6	13	33.8	14.2	24.3	9	6 0	2	19	9	2	6	.77	S.
Knoxville, Tenn.	61.3	84.8	29	35.5	21	49.3	23.9	36.0	15	13.0	9	19	7	4	9	4.00	N.
Charlotte	63.2	91.0	29	38.3	25	52.7	21.4	34.9	...	13.2	...	13	13	4	7	2.36	S. W.
Fort Macon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lynchburg, Va.	50.3	88.9	9	31 3	25	57.6	25.8	43.8	27	11.2	23	17	9	4	7	1.67	N.W.
Chapel Hill	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kitty Haw.k	57.5	92.0	30	39.4	21	52.6	21 3	39.3	29	9.2	12	...	...	...	12	1.17	...
Wilmington	61.7	87.5	31	37.3	26	50 2	20.8	32.2	29	12.2	10	15	9	6	6	1.10	S. W.
Wake Forest	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TEMPERATURE REPORT FOR MAY, 1888.

STATIONS.	TEMPERATURE.											NO. DAYS.					
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.	Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
Hatteras	67.7	78.6	30	48.8	3	27.8	10.8	18.7	4	4.2	11	6	16	9	11	7.27	S.
Knoxville, Tenn	66.7	87.0	27	36.0	15	51.0	18.8	32.0	...	7.0	..	6	12	13	16	6.30	S. W.
Charlotte	65.2	94.0	28	40.0	15	51.0	21.0	30.5	18	6.7	10	2	15	14	19	5.64	S. W.
Fort Macon	......	....	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Lynchburg, Va	64.0	89.5	28	41.2	3	48.3	18.1	29.8	6	8.0	27	3	11	17	19	5.75	N. E.
Chapel Hill	......	......	...	......	...	......	....	......	...	......	...	...	...	...	....	....	....
Kitty Hawk	68.6	93.3	28	46.0	22	52.3	19.5	37.9	...	7.6	...	...	...	...	....	5.80	....
Wilmington	69.9	85.5	26	50.7	14	34.8	14.2	26.3	14	5.6	21	6	16	9	9	4.41	S. W.
Wake Forest	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Average	......	......	...	......	...	......	......	....		......	...	...	...	...	....	....	....

TEMPERATURE REPORT FOR JUNE, 1888.

STATIONS.	TEMPERATURE.											NO. DAYS.					
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.	Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
Hatteras	73.1	84.0	29	59.0	5	24.0	9.6	16.5	10	5.5	a	13	13	4	8	4.30	S. W.
Knoxville, Tenn	73.3	95.0	19	49.7	4	45.3	19.8	28.4	...	9.1	.	13	13	4	11	4.18	S. W.
Charlotte	77.0	98.0	21	55.3	4	42.7	21.5	30.1	...	9.7	...	2	22	6	10	1.66	S. W.
Fort Macon	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Lynchburg, Va	74.1	96.5	21	49.7	4	46.8	21.7	33.7	5	9.2	27	8	16	6	5	2.24	N. E.
Chapel Hill	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Kitty Hawk	75.8	98.5	23	57.5	5	41.0	18.5	30.6	10	7.6	3	...	...	...	6	4.65	S. W.
Wilmington	75.6	93.8	26	52.8	4	41.0	16.9	26.0	7	10.3	b	10	13	7	10	3.58	S. W.
Wake Forest	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Average	74.8	91.1	...	54.	...	4.01	18.0	27.5	...	8.6	...	9	16	5.	8	3.41	S. W.

TEMPERATURE REPORT FOR JULY, 1888.

STATIONS.	TEMPERATURE.											NO. DAYS.				Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.		
Hatteras	74.6	85.4	12	62.0	4	23.4	10.1	20.9	...	4.4	...	...	...	...	6	6.24	N. E.
Knoxville, Tenn.	75.6	93.0	7	60.4	14	32.6	20.2	25.1	...	7.7	...	14	14	3	9	3.45	E.
Charlotte	77.5	99.6	12	60.0	16	39.6	22.2	30.8	12	14.0	20	3	5	13	11	1.68	N. E.
Fort Macon	......	......	...	......	...	......	......	......	...	......	...	...	...	...	......	....	....
Lynchburg, Va.	73.4	95.0	7	55.4	15	39.6	22.5	30.5	...	9.8	...	...	...	...	11	2.59	*
Chapel Hill	......	......	...	......	...	......	......	......	...	......	...	...	...	...	......	....	....
Kitty Hawk	76.5	100.2	10	59.3	4	40.9	13.8	30.8	13	8.3	22	...	...	...	9	3.92	....
Wilmington	75.9	95.9	12	59.8	3	36.1	17.1	25.4	12	5.5	29	11	11	9	11	5.87	E.
Wake Forest	......	......	...	......	...	......	......	......	...	......	...	...	...	...	......	....	....
Average	75.7	94.8	...	59.5	...	35.4	17.6	27.2	...	8.3	...	...	...	...	9	3.96	N. E.

*N. E. S. E.

TEMPERATURE REPORT FOR AUGUST, 1888.

STATIONS.	TEMPERATURE.											NO. DAYS.				Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.		
Hatteras	77.4	87.8	9	66.2	24	25.6	8.8	13.6	30	6.0	13	17	11	3	13	2.36	S.
Knoxville, Tenn.	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Charlotte	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Fort Macon	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Lynchburg, Va.	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Chapel Hill	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Kitty Hawk	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Wilmington	76.9	95.2	7	58.8	24	36.4	16.4	23.0	27	4.1	18	11	11	9	13	4.61	S. W.
Wake Forest	......	......	...	......	...	......	......	......	...	......	...	...	...	...	....	....	....
Average	75.5	9[illegible].1	...	60.4	...	30.2	10.0	19.4	...	5.0	...	...	...	...	....	3.40	S.

TEMPERATURE REPORT FOR SEPTEMBER, 1888.

STATIONS.	TEMPERATURE.											NO. DAYS.				Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.		
Southport	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...
Hatteras	72.6	83.8	1	50.2	30	33.6	8.2	12.8	26	6.6	18	10	12	8	14	6.63	S.
Knoxville, Tenn.	64.3	85.0	14	35.0	30	...	17.0	29.0	12	3.0	15	12	7	11	13	6.55	E.
Charlotte	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lynchburg, Va	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chapel Hill	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kitty Hawk	71.6	97.0	1	38.9	30	...	17.1	27.1	30	8.1	25	...	...	...	15	9.40	...
Wilmington	71.1	87.5	4	43.9	30	...	14.9	24.4	...	4.8	25	6	8	16	16	8.28	...
Wake Forest	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average	69.2	88.5	...	44.7	...	33.6	13.7	18.7	...	4.6	...	...	...	...	...	7.28	...

TEMPERATURE REPORT FOR OCTOBER, 1888.

STATIONS.	TEMPERATURE.											NO. DAYS.				Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.		
Southport	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hatteras	60.8	76.0	11	48.2	2[illegible]	27.8	10.3	.23	11	4.6	7	17	8	6	8	3.99	N.
Knoxville, Tenn.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Charlotte	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lynchburg, Va	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chapel Hill	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kitty Hawk	60.2	78.6	2	42.9	21	35.7	17.5	26.6	1	6.3	26	...	...	...	11	5.42	...
Wilmington	59.7	79.2	6	44.7	18	...	16.5	25.7	19	6.8	25	13	7	11	13	5.65	...
Wake Forest	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...
Average	60.[illegible]	78.7	...	45.6	...	30.1	14.1	24.9	...	5.7	...	...	...	...	...	4.78	...

TEMPERATURE REPORT FOR NOVEMBER, 1888.

STATIONS.	TEMPERATURE.											NO. DAYS.				Total rain-fall, including hail, snow and sleet (in inches.)	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.		
Southport	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hatteras	56.8	74.2	2	37.7	26	36.5	8 5	17.4	2	4 0	22	12	6	12	12	5.52	N. E.
Knoxville, Tenn	47.8	77.0	7	26.0	27	31.0	......	15.0	1	3.0	30	6	9	15	17	3 19	N. E.
Charlotte	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lynchburg, Va	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chapel Hill	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kitty Hawk	57.9	79.5	5	34.3	29	45.2	15.8	31.0	...	5.2	...	...	...	...	...	3.16	...
Wilmington	54.2	79.3	3	35.8	27	22.0	13.9	22.0	..	4.0	...	11	5	14	14	5.50	N. E.
Wake Forest	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average	50.7	76.7	...	29.7	..	30.6	12.7	19.8	...	4.0	...	...	...	...	...	4.60	N. E

TEMPERATURE REPORT FOR DECEMBER, 1888.

STATIONS.	TEMPERATURE.											NO. DAYS				Total rain-fall, including hail, snow and sleet (in inches).	Prevailing wind.
	Mean monthly.	Highest.	Date.	Lowest.	Date.	Range.	Mean daily range.	Greatest daily range.	Date.	Least daily range.	Date.	Clear.	Fair.	Cloudy.	On which rain fell, including hail, snow and sleet.		
Southport	46.3	62.4	9	23.0	21	29.4	......	24.2	21	5.0	10	...	...	...	6	3.20	N.W.
Hatteras	45.3	65.4	26	28.3	22	37.1	10.6	24.7	16	4 4	6	18	5	8	6	5.81	N.W.
Knoxville, Tenn	37.2	60.0	16	22.0	*	16.0	26.0	26.6	16	3.0	13	15	5	11	8	1.90	N. E.
Charlotte	39.8	65.5	26	20.2	21	39.8	18.2	30.8	24	6.5	17	18	5	8	9	3.67	N.W.
Lynchburg, Va	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chapel Hill	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kitty Hawk	46.5	72.0	9	25.0	14	40.0	19 0	30.0	19	5.2	11	...	...	...	8	7 06	N.W.
Wilmington	43.6	67.7	27	25.8	21	......	16.4	28.0	...	4 0	...	16	8	7	11	2.92	N.
Wake Forest	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average	41.5	64.7	...	24.8	...	30.9	18.2	25.4	...	4.8	...	...	...	...	...	4.70	...

* 20 and 21.

TABLE SHOWING CONDITION OF JAILS FOR YEAR 1887, IN THE COUNTIES REPORTING TO THE STATE BOARD OF HEALTH.

COUNTIES.	Number of Prisoners confined during												Average number			Cubic feet space allotted to each.	GENERAL REMARKS ON SANITARY CONDITION.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Confin'd dur'ng the year.	Vaccinated.	Which can read and write.		
Alamance	...	...	...	...	...	...	4	3	4	6	4	6	4	2	2	742	As good as the building will permit.
Alexander	...	...	...	..	...	...	...	1	...	...	2	2	2	0	1	629	Better.
Asbe	...	...	...	...	...	...	...	6	...	...	...	...	6	1	5	165	Building a jail.
Beaufort	10	4	5	7	...	4	3	6	10	...	...	...	6	...	......	....	No report.
Brunswick	..	...	...	...	5	...	5	5	...	...	...	...	5	...	......	....	Not good.
Buncombe	13	12	8	6	6	16	18	13	10	10	11	25	13	7	7	1,491	Good.
Burke	...	..	...	...	...	...	3	4	5	...	...	...	4	...	......	....	No report.
Cabarrus	2	4	5	5	3	2	2	5	4	...	2	4	3	4	5	1,256	Good.
Catawba	8	0	3	2	1	2	2	5	2	3	...	...	3	4	1	1,555	Good.
Chatham	1	2	1	1	1	1	...	...	1	1	...	...	1	1	2	9,450	Very good.
Cherokee	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2,854	No improvement.
Cleveland	10	12	18	16	18	6	6	...	6	7	9	10	10	3	42	585	Good.
Columbus	9	6	5	12	12	8	4	...	5	5	5	7	7	5	3	2,497	Clean and properly disinfected.
Cumberland	...	5	5	6	6	7	3	2	6	6	6	2	5	2	3	800	First-class order.
Davidson	3	4	4	17	7	14	11	7	2	9	8	11	8	0	0	1,83[illegible]	Good.
Duplin	1	2	1	2	0	1	1	3	7	3	2	2	2	0	0	588	Good.
Durham	4	11	15	5	6	6	7	13	12	15	3	5	8	5	12	1,115	Good.
Edgecombe	20	8	...	...	...	...	13	29	16	17	17	20	17	...	36	440	Not good.
Forsyth	...	...	13	0	0	18	12	15	24	34	20	16	19	4	4	1,086	Very good.
Franklin	6	2	7	7	3	6	6	4	5	8	9	1	5	8	14	1,780	Good as can be obt'd.
Gaston	7	7	16	12	0	6	6	0	5	9	4	5	7	17	4	842	Good.
Greene	3	3	3	6	2	2	1	2	3	4	4	6	3	5	4	637	Very good.
Henderson	...	...	4	4	7	9	16	14	8	0	8	15	8	0	4	781	Very good.
Guilford	20	0	25	0	0	36	...	...	...	...	22	...	25	8	3	....	Fair.
Iredell	...	...	15	12	19	30	17	12	30	52	0	26	21	0	7	585	Very fair.
Johnston	15	12	1	5	9	10	8	...	16	...	...	...	9	2	6	904	Very good indeed.
Jones	2	4	4	4	4	0	0	2	4	10	10	3	11	4	10	2,093	Good.
Lenoir	6	8	6	2	4	5	6	6	4	6	1	4	5	1	4	287	Good.
Lincoln	5	5	10	16	4	5	4	4	4	5	5	4	6	0	0	1,473	About as usual.
Macon	5	3	4	5	3	5	5	5	6	0	2	0	4	2	3	502	Good.
Madison	5	1	5	2	0	3	0	2	2	2	2	2	......	8	......	544	Good.
McDowell	6	7	4	4	5	1	1	1	0	2	1	9	4	3	7	627	Good.
Montgomery	0	0	0	2	1	2	2	0	2	3	3	1	2	1	2	600	Fair.
New Hanover	5	11	17	31	18	11	17	24	38	20	18	18	17	5	9	534	Excellent.
Northampton	0	2	2	0	0	1	0	0	2	4	4	0	2	2	4	1,160	Good.
Pender	..	...	...	...	...	...	...	1	8	0	6	...	5	...	......	....	Not yet completed.
Pitt	...	...	...	...	...	5	...	6	9	...	10	24	11	...	......	....	Not good.
Richmond	15	5	3	5	11	13	8	4	10	7	11	12	8	3	2	1,414	Good.
Robeson	12	20	9	4	4	12	15	19	11	19	0	10	12	3	5	694	Fair.
Rowan	6	4	5	5	11	7	16	13	22	15	13	14	10	1	3	1,235	Pretty good.
Rutherford	5	7	7	7	3	4	5	5	...	...	7	4	15	...	1	856	Very good condition.
Sampson	3	2	1	0	2	1	1	5	0	7	2	2	2	1	2	1,220	Good.
Stanly	3	3	0	0	8	3	2	...	...	2	...	7	4	1	2	1,100	Pretty good.
Swain	2	1	2	3	1	0	8	1	2	2	3	...	2	2	4	559	Not very good.
Tyrrell	1	1	1	1	1	1	0	0	...	1	1	...	1	0	1	1,100	Good.
Transylvania	...	...	...	...	...	...	...	2	[illegible]	3	4	...	2	2	2	....	Excellent.
Union	6	7	5	5	6	10	7	15	25	4	...	5	9	2	1	1,368	Bad.
Vance	...	...	...	...	...	...	2	2	4	3	...	3	3	2	2	....	Good.
Wake	...	...	...	16	...	...	...	14	20	40	8	9	18	...	......	2,152	Needs a more unifom heat.
Warren	8	0	3	3	0	7	5	2	4	4	...	1	4	0	5	2,152	Very good.
Washington	...	...	4	...	...	...	...	..	...	...	...	...	4	...	......	950	Ordinary.
Watauga	0	1	3	0	0	3	0	2	2	..	..	...	2	...	......	....	Bad.
Wayne	...	...	...	...	12	10	10	10	9	3	8	14	9	5	11	400	No report.
Yancey	2	0	1	...	...	...	...	...	...	...	...	...	1	0	1	......	Not good.

TABLE.—SHOWING CONDITION OF JAILS FOR THE YEAR 1888, IN COUNTIES REPORTING TO THE STATE BOARD OF HEALTH.

COUNTIES.	No. of Prisoners Confined During												Average Number				General Remarks on Sanitary Condition—December 31, 1888.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Confined during the year.	Vaccinat'd.	Which read and write	Cubic feet space allotted to each.	
Alamance	6	6	7	1	1	4	4	3	3	1	3	6	3	2	2	722	Good.
Alexander	......	3	2	4	1	1	1	5	3	3	......	5	2	......	2	1,087	Fair.
Ashe	......	......	......	......	......	2	2	......	1	4	......	3	2	1	......	338	Rebuilding the jail.
Beaufort	10	10	4	5	7	4	4	3	6	10	12	20	5	3	4	910	Good.
Brunswick	......	......	......	5	......	......	5	......	......	......	......	......	......	......	......	......	
Buncombe	26	24	......	15	......	25	25	9	......	14	......	20	19	8	10	846	Very good.
Camden	......	......	1	1	1	1	1	2	2	2	2	2	1	......	......	......	Very good.
Caldwell	1	......	1	4	4	1	1	1	1	4	5	1	2	4	2	1,191	In a dilapidated condition.
Cabarrus	......	2	2	3	2	......	4	9	11	......	22	......	4	4	4	1,688	Good.
Caswell	5	6	5	6	6	9	9	14	7	7	5	3	7	......	2	380	Fair.
Catawba	......	3	5	2	4	2	7	10	2	1	2	6	4	2	33	2,784	In as good condition as its nature will allow.
Chatham	2	4	1	1	3	3	3	3	1	4	2	2	2	2	1	3,332	Clean and nice.
Carteret	......	......	......	......	......	1	1	1	2	2	......	4	1	......	1	1,778	Good.
Cherokee	......	......	1	......	1	1	1	......	......	......	......	......	1	......	......	......	In ordinary condition.
Cleveland	10	10	10	11	12	6	6	4	12	9	8	16	8	......	5	657	Too cold—has been improved with a stove.
Columbus	8	4	2	2	2	2	2	3	2	1	1	3	3	8	1	7,714	Not sufficiently heated for comfort.
Cumberland	......	6	12	18	18	8	8	6	8	6	......	19	10	......	7	800	Good.
Currituck	3	......	......	......	......	......	......	......	......	......	......	......	3	1	......	800	Good.
Davidson	16	12	12	5	9	12	12	9	9	......	......	9	10	......	2	1,166	Bad.
Duplin	2	......	......	......	2	6	6	......	8	9	2	1	5	......	......	683	Fair.
Durham	14	6	8	2	7	8	8	19	18	18	21	18	11	......	6	911	Good.
Edgecombe	16	15	12	17	10	16	16	......	4	7	4	12	12	1	2	841	Jail completed.
Forsyth	18	36	35	30	28	21	21	24	24	22	......	24	29	10	6	1,008	Very good.
Franklin	5	1	3	4	......	......	......	11	2	2	8	4	4	......	1	4,371	Very good.
Gaston	6	6	8	4	4	10	10	......	13	17	5	5	8	2	3	1,175	Want of proper ventilation.
Granville	......	10	9	8	10	12	12	17	18	3	......	5	11	3	4	2,500	Good.
Greene	6	6	7	9	15	1	1	1	2	2	2	3	5	......	1	5[illegible]2	Deficient both in light and air.
Guilford	12	16	20	16	21	19	19	15	14	24	......	14	16	8	10	566	Very good.
Haywood	1	......	......	3	......	......	......	......	......	......	......	......	2	......	......	5[illegible]0	Small and ill-arranged.
Henderson	12	5	8	5	1	3	3	4	4	14	4	4	8	......	4	1,155	Construction of building bad.
Iredell	15	14	13	20	20	11	11	9	15	......	......	14	14	......	......	1,530	Fairly good condition.

TABLE.—SHOWING CONDITION OF JAILS FOR THE YEAR 1888, &C.—(CONTINUED.)

COUNTIES.	No. of Prisoners Confined During												Average Number				General Remarks on Sanitary Condition—December 31, 1888.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Confined during the year	Vaccinated.	Which can read & write.	Cubic eet space allotted to each.	
Johnston		5	2	3	6	7	7	8	8	4	6	7	5	2	4	3,844	No effort at improvement.
Jones	2	2	2	1	1						2	8	2		1	4,335	Good.
Lenoir	6												6			263	No report.
Lincoln	4				3	4	4	5	5	3		5	4			1,657	Old fashioned and poorly heated.
McDowell	9	5	5	7	5	4	4	3	2	2	4	2	4	1	2	599	Good.
Macon		2	1	3	4				2	5	3	2	3	2	1		Good.
Madison	1	2	2	4	1	4	4	1	2	2		4	2		6	927	Good.
Martin			8	6	8	7	7	16	14		5	7	9	2	4	744	Good.
Montgomery	1				2	1	1					2	1			800	Good enough.
New Hanover	45	11	19	27	22			28	23	31	24	10	26	11	13	580	Good condition.
Northampton	4	2		4				1	2			8	2	1	2	900	Good.
Onslow								5	7	5	7		5			1,097	Good.
Pitt	23	6	7										12			1,717	Not good—no effort at improvement.
Pender				1	2	2	2			1			1		2	480	Good.
Person		3	3		2			5	3		2	8	3		2	2,021	Jail not finished.
Richmond	12			10		8	8	12	12				11	2	3	517	Good.
Robeson	13	9	3	6		6	6	11	9	13	10	13	8			967	Good.
Rowan	14	17	8	11	14	9	9		4	2	4	8	9	2	4	1,200	Good.
Rutherford	3	4	4	3	3	5	5	4	4		2	10	4		3	1,872	All right and well kept.
Sampson		1	6	9	10	5	5	4	5				5		1	985	Need of a new jail.
Stanly	2	2	1	1	4	3	3	3	5		3	3	2		1	1,500	Fair.
Swain	3		1						3	3	2		2				Good.
Transylvania	2	2			2	2	2	2	1	2			2	2	2	1,440	Excellent.
Tyrrell																1,100	Good.
Union	2	2	1	2		4	4	9	9		2	6	4			6,100	Inferior.
Vance	7	11	1	6	7	9	9	12	12	10	7	7	8	4	4	1,140	Good.
Wake	20	7	13	14	4	11	11	40	7	51	57	18	18			2,905	Prisoners lodge in farm houses.
Warren	1	1	1	2	2	2	2	2	2		3	3	2		2	4,687	In splendid condition.
Watauga				2	2				2			1	2			300	Bad.
Watauga	8	20	8		3			5	9	6	5	9	8	2	2	735	Good.
Wayne		11	5	5	10	6	6	8	7	11	12	7	8	2	2	1,776	Good.
Yancey		1	1	1							3	3	8			3,240	Tolerably good.

TABLE SHOWING CONDITION OF POOR-HOUSES FOR YEAR 1887, IN THE COUNTIES REPORTING TO STATE BOARD OF HEALTH.

Counties.	Number of Inmates during												Average Number			Space in cubic feet allotted to each inmate.†	General Remarks on Sanitary Condition of Poor-House.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	For the Year.	Vaccinated.	Which can read and write		
Alamance	...	..	...	...	...	...	19	19	19	19	19	20	19	6	3	1,000	As good as building will permit,
Alexander	...	...	..	...	...	..	...	5	6	6	4	5	5	...	1	600	Better.
Ashe	...	...	.	...	..	...	.	11	..	..	...	10	10	1	2	200	Good.
Brunswick	..	8	7	...	6	...	6	4	...	...	...	...	6	...	2	...	Not good.
Buncombe	26	26	26	25	25	25	25	27	25	26	26	26	25	25	19	775	Good.
Cabarrus	15	19	19	20	21	20	20	18	21	24	20	20	18	7	8	1,665	Good.
Camden	...	...	...	6	6	...	...	6	...	...	6	6	6	...	3	900	Good.
Caswell	...	...	...	...	...	...	...	...	...	...	.	29	29	...	...	600	In fine condition.
Catawba	18	...	19	18	17	20	21	23	21	...	...	23	18	7	10	1,000	Repairs going on.
Chatham	30	30	30	30	30	30	...	..	24	25	24	...	26	10	7	700	Good.
Cherokee	6	4	4	6	...	6	5	...	2	2	2	1	4	1	1	800	No improvement.
Cleveland	36	32	34	34	31	31	32	...	33	34	35	38	32	...	7	550	Good.
Columbus	6	6	6	6	6	5	4	...	5	4	4	4	5	...	...	729	Very good.
Cumberland	...	20	20	18	14	14	14	22	16	20	16	10	16	11	9	800	In first-class order.
Davidson	15	15	16	18	18	18	17	16	16	14	14	14	16	5	5	720	Good.
Duplin	8	8	9	10	11	11	13	13	11	16	11	13	11	...	...	...	Good.
Durham	5	*17	*20	*22	*19	*17	*19	*17	*19	*10	10	9	17	3	6	700	Good.
Edgecombe	23	...	25	...	.	..	19	20	22	21	25	16	21	..	2	3,168	Good.
Forsyth	...	...	17	...	..	22	28	24	22	26	27	26	24	9	2	...	Very good.
Franklin	12	11	13	14	14	16	14	16	16	16	15	18	15	12	1	750	Good.
Gaston	12	11	11	10	...	13	12	...	13	13	13	15	11	3	4	2,244	Excellent condition.

*Including House of Correction.

TABLE SHOWING CONDITION OF POOR-HOUSES, &c., FOR THE YEAR 1887—CONTINUED.

COUNTIES.	NUMBER OF INMATES DURING												AVERAGE NUMBER			Space in cubic feet allotted to each inmate.†	General Remarks on Sanitary Condition of Poor-House.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	For the Year.	Vaccinated.	Which can read and write		
Greene	6	6	6	9	9	8	8	7	7	7	7	7	7	4	1	1,000	Excellent condition.
Guilford	34	....	38	....	....	31	....	37	....	....	26	..	31	6	12	......	Moderately good.
Henderson	....	....	6	6	6	6	6	5	5	....	5	5	5	....	....	900	Very good.
Iredell	....	....	16	21	23	20	20	20	15	....	20	23	13	....	4	482	Good condition.
Johnston	16	17	15	....	10	12	14	....	15	....	....	....	14	2	1	700	Very good indeed.
Jones	4	4	4	4	4	4	4	4	4	4	4	5	4	3	....	490	Good.
Lincoln	14	15	14	17	14	18	18	16	16	20	20	19	17	...	...	518	Frail and not large enough.
McDowell	11	12	12	12	9	12	12	10	10	8	11	10	10	3	2	425	Good.
Madison	6	6	6	6	..	12	...	6	6	6	6	6	6	...	1	2,100	Sanitary condition good.
Montgomery	12	12	10	12	12	11	11	....	10	11	12	12	10	....	2	500	Fair.
New Hanover	31	*40	*41	*35	*33	*38	*26	*28	*31	*32	*28	*24	27	25	24	600	Well kept, clean and well aired.
Northampton	....	36	36	36	34	36	36	35	30	38	38	....	34	15	9	465	Good.
Onslow	8	....	....	....	....	....	...	....	....	....	6	7	7	....	1	1,250	Unplastered.
Pender	7	...	7	7	....	8	....	7	6	6	....	6	6	2	1	200	Not suited for the purpose.
Person	....	22	20	....	9	20	...	....	23	....	...	....	20	2	5	630	No report.
Pitt	....	....	...	....	...	...	...	20	..	....	....	19	19	....	....	......	Good.
Richmond	12	12	13	12	12	15	14	15	14	14	....	13	13	3	3	575	Good.
Robeson	8	8	8	8	8	8	9	9	10	10	....	9	9	4	1	600	Fair.
Rowan	30	33	33	32	21	21	21	23	16	16	....	13	21	4	3	400	Pretty good condition.
Rutherford	24	24	24	24	34	35	40	...	....	....	....	27	22	8	12	648	Excellent.
Sampson	10	11	3	18	19	19	21	20	20	17	....	17	16	2	1	1,319	Good.
Stanly	7	7	....	....	7	7	8	....	....	7	....	7	7	....	....	800	Good.

Tyrrell	3	3	....	4	4	4	...	5	3	3	....	3	3	....	....	1,100	Good.
Union	16	13	15	22	18	18	15	16	16	....	....	14	14	..	....	800	Good.
Wake	....	...	....	*70	....	....	..	55	*16	63	...	58	52	....	....	304	Good.
Warren	11	11	13	12	..	12	15	12	9	9	..	13	10	....	....	1,572	Very good.
Washington ..	..	5	5	...	...	4	....	3	....	...	....	.	4	1	1	950	No report.
Watauga	8	8	8	..	....	9	8	..	8	8	...	....	8	....	....	.. .	Good.
Wayne	...	....	....	....	7	7	12	8	13	10	...	12	10	...	....	1,650	Good.

*Including House of Correction. †Smallest space reported during the year is given.

TABLE SHOWING CONDITION OF POOR-HOUSES FOR THE YEAR 1888, IN THE COUNTIES REPORTING TO THE STATE BOARD OF HEALTH.

COUNTIES.	NO. OF INMATES DURING												AVERAGE NUMBER			Cubic feet space alloted to each.	General Remarks on Sanitary Condition of the Buildings.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Confined during the year.	Vaccinated.	Which can read and write		
Alamance	22	24	26	24	26	23	19	24	24	24	24	36	24	6	3	500	Good.
Alexander	..	5	5	5	5	5	5	6	4	5	.	6	5	5	1	873	Good.
Ashe	11	11	11	11	11	11	11		7	7	7	7	10	1	1	454	Good.
Beaufort	12	12	12	10	11	15	17	15	13	12	..	14	12	3	2	1,000	Good.
Buncombe	25	26	..	22	..	23	23	21	..	20	..	21	23	16	15	200	Very good.
Brunswick	..	6	..	6	..	..	6	.	..	..	..	11	6	No	rep	ort.	No report.
Cabarrus	..	14	14	14	14	16	14	14	16	..	14	..	14	12	9	1,272	Good.
Caldwell	8	8	8	8	7	7	8	7	7	7	7	7	7	.....	2	591	Fair.
Camden	7	7	8	8	8	..	8	7	7	7	8	7	7	Not	repor	ted.	Good.
Carteret														Not	repor	ted.	Clean and comfortable.
Caswell	28	29	26	28	28	27	29	24	21	22	24	27	26	......	9	1,000	Very good.
Catawba	..	28	30	25	23	23	23	24	25	28	28	30	24	7	9	738	Good.
Chatham	24	24	23	23	23	20	30	21	20	20	20	18	23	10	10	1,220	Good.
Cherokee	4	6	4	4	4	4	5	1	1	1	1	2	3	1	1	800	Good.
Cleveland	40	45	49	50	45	40	45	40	39	42	46	45	44	......	7	757	Very good condition.
Columbus	4	5	5	6	7	7	7	6	7	6	6	6	5	......	......	617	Good.
Cumberland	..	15	16	14	14	16	14	16	14	18	16	16	15	11	8	1,000	Good.
Currituck	15	*															
Davidson	14	14	21	21	21	20	20	21	20	20	21	20	18	......	5	720	Good.
Duplin	13	17	15	32	21	22	21		18	30	18	13	20	......	5	520	Not good.
Durham	10	11	13	13	10	11	29	12	12	12	12	17	13	......	3	1,000	Good.
Edgecombe	26	35	40	40	37	39	39	..	35	39	36	34	35	......	2	1,980	Good.

Forsyth	28	37	25	29	17	20	22	22	18	16	16	18	23	6	3	Not reported	Very good.
Franklin	14	18	17	14	17	17	16	11	17	17	17	17	15	......	1	3,000	Very good.
Gaston	14	15	12	10	12	14	14	11	11	11	11	12	12	4	4	2,244	Excellent.
Granville	..	25	20	20	28	23	24	28	25	23	23	23	24	4	6	3,000	Good condition.
Greene	8	8	..	8	9	8	..	11	11	10	10	10	9	......	......	1,000	Large and airy.
Guilford	30	25	26	38	27	28	39	39	39	36	40	32	32	12	15	1,150	Well kept and in fine sanitary condition.
Haywood		..	..	6	8	..	..	..		8	..	..	7	......	1	300	Very comfortable.
Henderson	4	4	3	4	8	3	3	4	4	4	4	3	4	......	1	1,500	As good as could be expected.
Hyde		..		4	..	4	...	..			..		4	Not	repor	ted.	Good condition and kept in good order.
Iredell	29	28	25	25	28	25	25	25	25	..	..	23	26	Not re	port'd	382	Fairly good condition.
Johnston	..	18	18	18	19	18	18	17	16	19	17	17	18	8	6	450	Very good.
Jones	5	5	4	5	5	5	7	7	7	6	6	4	5	1	3	560	Good.
Lincoln	19	20	20	20	20	19	20	21	21	21	20	20	20	Not re	port'd	493	Cannot afford protection against extreme cold.
McDowell	9	11	9	9	9	6	7	8	8	8	6	5	8	2	2	425	Good.
Macon	..	1	.	1	..		..	..	1	..	..	.	1	1	......	500	Good.
Madison	6	6	6	6	6	8	6	8	6	8	8	8	6	......	..	1,544	Good.
Martin	6	6	6	6	5	5	5	10	10	10	9	13	6	......	3	700	Good.
Montgomery	12	13	12	18	18	18	18	12	12	11	11	12	14	......	2	500	Good enough.
New Hanover	23	18	21	21	24	24	19	19	19	18	19	19	20	13	6	600	Good; exterior repairs about to be made.
Northampton	38	36	30	30	28	28	29	30	36	36	37	37	31	14	9	465	Bad condition; defective privy arrangem'ts.
Onslow	..	7	7	7	.	..	...	7	7	6	7	..	7	1	1	428	Building inferior.
Pitt	19	20	21	.	..	..	...		..	..	..	..	20	Not re	port'd	700	Fair.
Pender	6	5	4	3	3	3	3	3	4	4	4	5	3	1	1	....	Good.
Person	14	16	16	14	17	24	24	7	24	14	17	14	18	.. ..	3	1,167	Good.
Richmond	13	13	14	14	14	15	14	14	14	..			14	3	3	210	Good condition, except cells for lunatics, which are too small and badly ventilated.
Robeson	11	10	10	10	10	10	10	10	10	10	10	9	10	6	1	720	Good.
Rowan	18	18	18	22	21	20	21	17	17	14	15	18	19	3	3	1,637	Good.
Rutherford	27	27	27	27	27	24	24	27	27	27	30	27	26	3	4	960	Well kept.
Sampson	20	22	22	18	16	16	16	18	18	17	7	..	18	1	2	1,460	Very good.
Stanley	7	7	6	6	7	7	7	8	7	7	7	9	7	......	......	2,000	Paupers kept by individuals.
Swain†																	
Transylvania	..	..	..	..	..	2	3	5	5	5	4	4	4	......	......	2,600	Excellent.
Tyrrell	..	3	3	4	4	3	4	3	..	3	3	..	3	......	......	1,100	Good order.

TABLE SHOWING CONDITION OF POOR-HOUSES FOR THE YEAR 1888, &c.—CONTINUED.

COUNTIES.	No. of Inmates During												Average Number			Cubic feet space allotted to each.	General Remarks on Sanitary Condition of the Buildings.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Confined during the year.	Vaccinated.	Which can read and write		
Union	12	12	13	12	12	12	15	15	15	15	13	15	13	......	2	600	Good.
Vance §																	
Wake	60	62	67	63	63	70	85‡	70	70	72	50	50	67	Not re	port'd	332	Good.
Warren	9	10	10	7	10	11	11	8	12	10	13	13	9	......	1	2,572	Splendid condition.
Watauga	8	8	8	8	8	8	8	8	8	8	8	4	8	4	2	....	Excellent.
Wayne	9	5	8	8	10		.	12	11	12	12	11	8	4	3	1,650	Good.
Wilson	18	18	19	19	21	16	21	20	20	18	18	18	19	3	2	932	Excellent.
Yancey	..		..		..	..	...		..	..	..		...	......	... ..	....	Tolerably good.

* In private families.
† No report.
‡ Includes House of Correction.
§ No Poor-House.

REPORT ON THE SANITARY CONDITION OF THE WESTERN INSANE ASYLUM.

To the Board of Directors Western N. C. Insane Asylum,
Morganton, N. C.:

GENTLEMEN:—The undersigned, members of a committee from the N. C. Board of Health, appointed by President Jones, at the request of the Superintendent to visit your institution, would respectfully report. We reached Morganton July 28th, and spent part of that day and of the next at the Asylum, considering the following subjects, upon which Dr. Murphy desired our opinion:

1st. The amount of water supply.

2d. The dietary list, the amount, quality and mode of preparation of the food furnished to the patients.

3d. The propriety of using the sewage of the institution on its garden.

4th. The difference between painted and unpainted walls, looked at from a sanitary point of view.

1. THE AMOUNT OF WATER SUPPLY.

In regard to the facts, we were compelled to accept the statements of the Superintendent, but we have no hesitation in expressing our perfect confidence in their trustworthiness. We learned from him that the total amount of water delivered at the Asylum through the supply-pipe from the mountain in 24 hours, was about 275 gallons per patient, more than enough, but that owing to the fact that there was no provision for storing any part of it, for that purpose, only about half of it could be utilized, or so much of it as was delivered during the waking hours of the institution. In consequence, during certain hours of the morning, when the draught upon the supply was greatest, the pressure was so much diminished that water could not be obtained above the second floor.

We regard water in the greatest abundance easily accessible at all points and at all hours as of the highest importance in the proper management of all hospitals, more especially those whose patients, on account of the nature of their complaints, are unusually filthy. We would, therefore, respectfully recommend that as soon as it can be arranged, storage for the water, at present running to waste, sufficient to keeping full pressure in the pipes at all times, be provided.

2. The Dietary List, &c.

We inspected the list, catechised the Steward on the subject, visited the kitchen, examined the dinner, the cooking, and talked with the housekeeper. In our opinion, the diet is sufficiently varied, excellent in quality, well prepared, and so far as we could judge (without a residence in the institution for a considerable time), ample in quantity.

3. The Propriety of using the Sewage on the Garden.

We think it inadvisable. Dr. C. W. Chancellor, "Secretary of the Maryland Board of Health," in his admirable report on Improved Methods of Sewage Disposal, &c., 1887, says: "The saturation of the soil in or near a town, by crude sewage matters, is a constant concomitant of epidemic diseases; while a proportionate exemption from such maladies has followed the removal of this source of ærial pollution." * * "The sewage, cleared of its solid matter by deodorizing and precipitating agents, may be used for fertilizing purposes, but even this purified liquid, if allowed to stagnate in large quantities on the surface, would, as in common irrigation, be likely to engender disease." Another reason against such an application of the sewage, which occurs to us, is that the appetites of nearly all invalids, more especially the insane, to whom the digestion and assimilation of a sufficiency of good food is of peculiar importance, is notoriously capricious and uncertain, and should it come to the knowledge of your patients, as it would of course, that their vegetables were largely the product of their own excrement, their appetites would be still more impaired. Finally, owing to its very great dilution, its profitable use would be exceedingly problematical.

4. THE HYGIENIC DIFFERENCE BETWEEN PAINTED AND UNPAINTED WALLS.

It is always desirable that hospital walls, or those of any apartment habitually occupied by sick people, should be of such a character as to absorb as little as possible of the effluvia constantly emanating from the patient. As painted walls have less power of absorption than hard finished, we think them preferable; but we can see no necessity for painting the walls of the Asylum, which are unusually good at present, though we would recommend that paint be applied when they need overhauling.

In conclusion, we desire to express our appreciation of the kindness and hospitality of Superintendent Murphy.

RICHARD H. LEWIS, M. D.
HENRY T. BAHNSON, M. D.

REPORT ON THE SANITARY CONDITION OF THE EASTERN N. C. INSANE ASYLUM,

BY DR. J. H. TUCKER, AND J. L. LUDLOW, C. E., M. S., COMMITTEE APPOINTED BY THE NORTH CAROLINA BOARD OF HEALTH AT THE INVITATION OF THE EASTERN ASYLUM FOR THE INSANE.

RALEIGH, N. C., July 21, 1888.

To the Superintendent and Board of Directors,
Eastern Insane Asylum:

GENTLEMEN:—In accordance with your invitation, and under instructions from the office of the Secretary of the State Board of Health, we would respectfully state, that on the 27th of June we made a careful sanitary inspection of the Institution over which you preside, and beg to submit herewith the following report:

We note with pleasure the present excellent health of the Asylum, and its exemption from epidemic diseases of all kinds for the past twelve months. When it is remembered that dysentery and diarrhœa have prevailed in epidemic forms throughout Eastern Carolina, and to some extent in the immediate vicinity of the Asylum, we are obliged to believe that the immunity enjoyed is the result of constant, vigilant and intelligent enforcement of the sanitary rules and regulations which seem to prevail in every department of this Institution.

The wards, dormitories, mess-halls, closets and pantries were found in good order and scrupulously clean, everywhere showing the effects of soap and water properly and vigorously applied. The air space in the dormitories is abundant (750 cubic feet space *per capita* being the allowance), and, with the exception noted under the head of ventilation there was an absence of all unpleasant and disagreeable odors. The beds, bedding, sheets and coverlets were neat, tidy and admirably adapted to the purpose for which they are designed.

The grounds and yards are in a good sanitary condition The superficial drains are all open, no accumulation of garbage, no standing water, and the entire premises showed evidences of constant and systematic attention.

The patients were neatly and comfortably clad, and their appearance indicated clearly that all proper rules of personal hygiene were rigidly enforced. While it does not come properly within the scope of this report, we cannot forbear to say, that the health authorities of the State can render these poor, unfortunate people no greater service than to strongly impress upon the county authorities the importance of early hospital treatment for the insane. These people, especially, come from the poor and more dependent of our inhabitants; they are found in their own homes in conditions of utter destitution, often suffering for the bare necessities of life; or else they are found in work-houses, poor-houses or jails, without treatment of any kind, and are physical as well as mental wrecks.

It is confidently believed that earlier recognition of insanity, with prompter efforts at treatment, will enable this Institution to show a greatly diminished death rate and a much more gratifying percentage of recoveries. We would respectfully commend this matter to the serious consideration of all persons who are in any way connected with the management and care of the insane throughout the State.

The kitchen was found in fairly good condition, the utensils were in good order and clean, but showed evidences of wear. The range is also much worn and is too small to meet the requirements of an Institution of this size. We recommend its condemnation, and the substitution of one of larger capacity and more approved pattern. To this should be added two or three large boilers of sufficient size to supply the Institution with soups and stews.

We were permitted to examine the bread (both corn and wheat), which was found to be of excellent quality, wholesome and palatable; indeed, the entire dietary, so far as we were advised, is sufficient in quality, quantity and variety, to meet all the requirements of health.

The ice supply seemed inadequate for the needs of the Institution, and there was no provision for preserving fresh meats, vegetables, fruits, butter and milk in warm weather. Both from an economic and health stand point, we would suggest the addition of a large refrigerator, with a sufficient number of compartments to meet these important ends. The cost of such an apparatus, when measured by the convenience and comfort afforded, would be trifling.

WATER SUPPLY.

The water supply of the Institution is from two sources, and obtained by two distinct systems. One supply is for drinking and culinary purposes; the other for general use and drainage purposes.

The supply for drinking and culinary use is rain water gathered from the roof and stored in cisterns. Such a supply is quite desirable and affords a very excellent quality of water—provided some precautions are taken in collecting it. This water should be collected and stored during the winter or rainy seasons. At various times during the year, the atmosphere is loaded with various impurities, which could not be safely introduced into our drinking water. During the summer or any dry period, the air may, and usually does, become very heavily laden with such impurities, from particles carried in dust from the streets and roads, from the gases of manufactories, from decomposition of various vegetable and animal substances and other sources. At such times the atmosphere may become contaminated to such an extent, that an ordinary, or at times an extraordinary, rain would not sufficiently purify the air to pass any portion of the rain water without its absorbing more or less of its impurities. Further demonstration is not necessary to show that it would be injudicious to collect rain water at such times for drinking or culinary purposes.

In the autumn season also, when so much of nature is in a state of death and decay, great care and limitation should be placed upon the collection and use of rain water.

During the winter and spring when rains are much more frequent and copious. the atmosphere is little likely to become dangerously contaminated. It is then in its most pure condition, and there is little danger of collecting evil impurities with rain water stored at such times, hence these are the seasons when these supplies should be obtained. Before storing rain water at this time, however, one precaution is quite necessary, the rain should be allowed to continue for a few moments to wash the roof of all substances which might be collected and deposited there, before the water is turned into the cistern. It gives us pleasure to state that we were informed by the authorities that these observations have been and are largely practiced, and we therefore feel assured that the supply is a very wholesome one. A further and very desirable purification they also obtain by passing the water from the storage tanks through a charcoal filter before it is used.

The water which is used for general purposes and drainage, is pumped from the river flowing near by to elevated tanks, giving a sufficient head to distribute the water throughout the institution. Hose connections are maintained with these tanks for use in case of fire. This supply is seemingly adequate for all demands and is of very fair quality.

DRAINAGE.

The drainage system we do not find in such favorable condition as the water supply. In its design and construction various errors have been made, the results of which might reasonably be expected to prove serious. While the evils which will be mentioned have not as yet apparently caused any serious results, as far as we could learn, yet they are disease tempters, and should be remedied at once, ere the good record of the drainage system be completely destroyed.

The house drains of the sewerage system are located in ditches or tunnels excavated beneath the building. These tunnels are at right angles to each other, one extending the entire length of the building, the other intersecting this from one side. They are provided and used for carrying all the service pipe of the building to the various distributions. The ventilation of these tunnels is very defective, and will be discussed more fully under the general head of ventilation.

The sewer pipes in these tunnels are buried to a slight depth and located so that iron soil pipe extensions are made from these to serve the closets in the various wards in the institution. These iron soil pipes are of proper size and extend to the roof of the building; on each floor, pan closets are connected with them, as well as bath tubs and wash bowls; kitchen and pantry sinks are also connected with these pipes. These service connections are in many cases in very bad condition; some are not trapped at all, and others very imperfectly trapped. All these connections should have a thorough remodeling and be put in perfect condition, as well as be provided with ventilating facilities, which will be further spoken of in what follows.

The iron soil pipes from the bath rooms, closets, &c., are carried to a terra cotta pipe in the tunnel, spoken of above this pipe continues to the outside of the building. From this point to the outfall at the river bank, there is a fourteen inch sewer pipe; at the outfall, provisions for carrying off the sewage rapidly had been neglected, but upon our recommendation, the Superintendent gave orders to have it remedied immediately.

The pipes are too large for the service required, and the system as a whole has very inadequate and imperfect ventilation, the evil effects of which itself is further aggravated by the excessive size of pipes.

Earthenware pipes should never be used in the construction of soil pipe in any drainage system, and in the case of these tunnels, though these pipes are buried, there is yet a possibility, and, indeed, a great probability, of sewer gas escaping from imperfectly made joints, and forcing its way through the slight covering of earth over them; such a case would be very much aggravated here on account of the slight air space in the tunnels and their imperfect ventilation; that there was such escaping sewer gas was too evident at the time of our visit by the odor of the air in the tunnels and in the corridor of the first floor above. These earthenware pipes beneath the building should at once be replaced by cast iron pipes, with carefully made lead joints, and frequently tested for leaks and imperfections. This is especially necessary when it is considered that the air from these tunnels is directly communicated to the wards and corridors of the building under the existing state of affairs; recommendations regarding the change of this will follow in this report.

The sewer from the building to the river is unnecessarily large, but it will not deserve serious criticism if frequently and copiously flushed, and the following provisions for ventilation are put in effect:

Thorough ventilation of the system should be provided, first, by constructing at least three (more would be better) ventilating shafts along the sewer from the building to the outfall, one of which should be placed near the outfall, one about midway to the building, and one near the building where the fourteen-inch sewer begins. The first two may be simply a piece of pipe or brick chamber extended from the pipe to the surface or high water mark, and provided with open covers.

The ventilator near the building should be a brick and cemented chamber, with bottom concentric with the outflowing pipe. All soil pipes and waste pipes should be led to this chamber. It should be of itself sealed from the external air, except by a ventilating pipe of three-inch cast iron, which should be carried from the chamber to a few feet above the top of the building, remote from any window or chimney. All inflowing pipes of this chamber should be provided with a running trap, ventilated on house side to ventilating pipe, just before entering the chamber. This will provide for good ventilation of the sewer itself and prevent any gases which may accumulate therein from entering the pipes within the building.

For the ventilation of the soil pipes, further provision is also necessary. The soil pipes, extending as they do to the roof of the building, will, in some circumstances, serve as ventilators, as they were evidently designed to serve, but when they are filled with water in an upper story, ventilation is completely cut off for all floors below, and the solid column of water rushing down the pipe tends to force the traps on the lower floors, if not otherwise ventilated, rather than to permit the pipe to serve as a ventilator. It is during a rain, however, that the existing arrangement displays its weakness and inadequacy. At such a time when rain from the roof is running down the soil pipes, as we were informed it usually does, the air and gases in the pipes are under the greatest compression, hence the greatest need for an opportunity of its escape. But just at this time, the pipe is running full of water and there is no avenue of escape, except to force the weaker trap or traps along its path. In brief, at the time ventilation is most needed, it is the least provided. To remedy this, there should be a two-inch cast iron pipe extended along but independent of the soil pipe to a few feet above the roof, this to serve as a ventilating pipe only, and all traps and connections should be ventilated through this pipe.

The pan closets in use are probably as good provision as can be made for people of this class, but their frequent flushing should never be neglected. In connection with these closets however, we found a great evil to exist in the floors of the rooms in which the closets, wash sinks, bath tubs, etc., are located. With this class of people especially, it is emphatically necessary that the floors should be made of some non-absorbing material, such as slate or tiles, as wood floors are apt to occasion much evil by absorbing various impurities consequent upon such places.

HEATING.

The building is heated by steam radiators distributed about the various corridors. While we do not approve of this method, it is yet one of the standard methods of heating, and we would reserve comment, except to say that we deem it urgently desirable that the steam conducting pipes which are suspended in the tunnels should be wrapped or covered, as very much heat is lost and unnecessary fuel consumed on account of the exposed portion of the pipes.

In suggesting the improvement of the heating system, we must preface our recommendations by observing that the present method serves only to heat and reheat and keep heated the same air, after being breathed and fouled and breathed over and over again, until it is laden with an enormous and extremely dangerous excess of carbonic acid gas; we cannot see how it can be otherwise in the cold season, when we were informed by the authorities that it is next to impossible to keep any windows open on account of the inclinations of the patients to keep off every encroachment of cold air and the existing ventilation being insufficient to overcome this difficulty.

Our recommendation for the improvement of the heating method is that in addition to the existing steam system, a heated air system be adopted. Detail plans for such a system would embody, provision for drawing air from the external atmosphere remote from any possible contamination, heating this air by passing it through a suitable furnace, conducting it throughout the building by the existing flues and such other ducts as might be required, and finally, when this air has served its mission by warming and being breathed, that it be conducted by other flues to the top of the building and returned again to the external atmosphere at such a point or points that it will not again be returned to the furnace. This system would serve the double purpose of supplying fresh air as well as heat. The two systems could be operated in harmony after a little experimenting to determine the relative amounts of heat to be supplied by the hot air furnace and the steam boilers in order to furnish sufficient heat and pure air to the inmates of the Institution. The adoption of these plans would very greatly simplify and aid materially in the adoption of the recommendations under the following subject of ventilation.

VENTILATION.

The ventilation of the Institution is defective and to be condemned. It consists of a system of flues extending from the tunnels before spoken of to the attic of the building, with openings to the different wards and corridors along their course, and terminating in the attic instead of directly into the external air. The air of this attic is drawn out by ventilators above the roof. The fresh air supply is taken from the tunnels; these are insufficiently supplied from the external air by the openings at the ends and by several small openings beneath the floor at the top of the tunnel. As stated before, the air of these tunnels is very foul and very unfit to be supplied to the building for fresh air, the case is quite similar to ventilating a dwelling house by taking the fresh air supply from the cellar, which is severely to be condemned.

To improve the ventilation, we recommend the following The air in the tunnels beneath the building should first be purified by furnishing a greater supply from the outside, and by replacing the terra cotta house drains by cast iron of sufficient weight and strength to admit of caulking the lead joints, so as to make them water and gas tight. The fresh air supply for the wards and corridors, should be obtained directly from the external atmosphere by some standard approved method, and the supply should be so adequate that it can at all times be mechanically regulated to suit the requirements for proper displacement. This air should be supplied directly to the inmates by one system of flues and carried away by flues entirely separate from these. The location of the openings to and from the flues would somewhat depend upon the system of heating which may be applied; with the present system of heating, however, and the problem simply one of supplying fresh air, we would recommend that the supply flue openings be placed near the ceiling, and the exhaust flues near the floor; this would give a desirable circulation to the air and more completely carry off the impurities or vitiated air, which, being heavier than the pure air, would be more generally collected near the floor.

In closing, we would state that some of the criticism may seem unjustly severe, and, in mitigation, we would also state that in this report we have not considered how other similar Institutions may be, but how this and all others should be, from a purely sanitary stand-point.

CONCLUSION.

In conclusion, we beg to make due acknowledgment to the Superintendent and his staff for the valuable aid rendered in making the survey, and to return our thanks for the hospitality extended to us during our stay at the Asylum.

Very respectfully,
Your obedient servants,
J. H. TUCKER, M. D.,
J. L. LUDLOW, C. E.

APPENDIX.

APPENDIX.

PRELIMINARY ENQUIRY INTO THE CAUSES OF DEATH IN NORTH CAROLINA, AND SOME SUGGESTIONS ABOUT THE FUTURE OF PREVENTION.

BY THOMAS F. WOOD, M. D.

Sanitary reformation, to be permanent, must be founded upon the conviction of insanitariness, and to convince a community of insanitary conditions we must have the figures and facts which have been carefully and honestly collected, intelligently recorded, digested, and interpreted. So then, we, at the very outset, meet with the difficulty, as regards our State at large, of a lack of sufficient information of vital statistics to make any but preliminary—but, we trust, practical—deductions.

Few towns in the State have kept records of death until since the State Board of Health was organized, with the exception of Wilmington; and death certificates were made compulsory there in 1873—since then Charlotte, Asheville, Durham, Fayetteville, New Berne, Raleigh, Goldsboro, Henderson, Oxford, Washington and Tarboro.

These towns have made their work regularly, and, I believe, conscientiously.

The county reports are deficient, and necessarily so, as the Superintendent of Health, who is required to collect certain items relating to disease and death, must rely upon the reports sent to him, and in very few counties have physicians been able to view the matter of reporting to the Superintendent of Health as of sufficient moment to take the small trouble necessary.

More education of the public, more harmony among the profession, and money to pay for the work, will one day bring about a system of vital statistics such as that of New Jersey, Michigan, Rhode Island, and other States. Although county reports are not founded on knowledge of actual numbers of deaths, still every Superintendent has means of knowing when any of the diseases dangerous to the public health exist, and, in general terms, to what extent. A few reports are mere perfunctory dashes of the pen, bearing upon their face, in the manner of chirography, a hurried guess of the state of things. In the main, though, one can get a pretty fair knowledge of the nature of diseases prevalent in the State by such information as we now possess.

For convenience, let us divide the State into natural sections—after the plan marked out by Dr. M. A. Curtis, the late distinguished botanist of our State, in his[*] "Woody Plants of North Carolina"—into *Lower, Middle, and Upper:*

"A line drawn from Blakly, on the Roanoke, in the direction of Cheraw, on the Pee Dee, will nearly indicate the western termination of the Lower district, although the actual boundary limit between these two is as irregular as a line of sea-coast, which, very probably, this once was."

"The Middle district reaches westward to the base of the Blue Ridge," and the Upper district all west of, and including, the Blue Ridge mountains. The Eastern section is distinguished as the region of the long-leaf pine; the Middle section as that of the oaks, and the Western, a flora, varying with every hundred feet of elevation, including firs and ferns and mosses and lichens. The difference of elevation between the mountains and the sea-coast, according to Dr. Curtis, "occasions a difference of vegetation equal to ten or twelve degrees of latitude." The influence of these divisions, making a varied topography, is easier to study than the habits of life of individuals, or farmers, or hamlets, villages and larger towns.

The study of all these influences on the career of a life must be left to the future, and will not be complete until after studying the drainage, ventilation, heating and water-supply, habits of cookery, indulgence in stimulants and tobacco, and the methods of labor and intervals of recreation, are patiently considered.

The population of this State is remarkable in many respects. The white population, now a homogenous whole, has not been varied by the influx of foreign inhabitants since the ante-revolutionary period (1775), the foreign population being about 5,000, according to the census of 1880, which is smaller than that of any State in the Union, except Florida. While large numbers of our population have emigrated to Southern States, the bulk of the population have little of that restless desire to go prospecting in the outside world, which marks the Northern and Western people. When the war broke out the bulk of our adult population in the army saw more of the outside world in their marches with the Army of Northern Virginia than they had ever seen before, and most of them, when they reached Carlisle, in Pennsylvania, were farther away from home than they had ever been before, or since. Unlike other States, we have no large city where the bulk of the population visit on business or pleasure, all their patronage being bestowed on the nearest village to them; no metropolitan ideas of fashion or manner of living enter into their daily life. The greatest change is in the manner of life of the negro. Emancipation virtually emptied a foreign population tino our towns; for the negro, cared for in the cabins of the master under rules of strict personal government, could be commanded to do for his well-being, while the emancipated negro considered that a home apart from the whites was the essence of personal and political freedom—to live in squalor, packed in small windowless rooms, to a degree that would nauseate a white man, and drive sleep away effectually, in a condition of perfect comfort; in sickness, trusting to any chance remedy brought to him, regarding his disease as matter of little concern to himself, but as a matter demanding service from the former white master or his present white employer—so firmly had this taken possession of his being while a slave. Personal cleanliness was utterly neglected, except as to the face and hands, and change of raiment; confined, in most cases, to the putting on of fine cast-off toggery for Sunday; rushing into contageous diseases with stolid indifference, and herding with each other during epidemics with helpless fatality. Small-pox is a disease which vaccination causes, in their belief, because they know that the white people vaccinate during the prevalence of small-pox, their blind deduction being that it was the cause. Syphilis, which was rare among negroes as slaves, became the most common of diseases. Promiscuous herding of the sexes spreads the disease with fearful rapidity. A negro man, applying for treatment for chancre, only desires (and he has not improved any to this day) to be relieved of the discomfort and inconvenience of the local sore, regarding it only as a barrier to further indulgence. In all essential respects, therefore, the negroes were, and are, a foreign population, below the people of any nation in decent instincts, and elevated from the condition of native Africans by the contact with the whites, entirely at the expense of the latter, and as burdensome, in many respects, as the old man of the sea was to Sinbad; the most patient and valuable of all laborers in a hot climate; the most tractable and easily influenced for good when segregated among the whites, but when herding among themselves, with no light but that of their own leaders, drifting always away from the good. A town, therefore, which has twenty thousand inhabitants, more than half of which are negroes, represents a lack of thrift and a lack of hygienic surroundings that really discounts the white population. In speaking of a town of this sort, as compared with one wholly of whites, numerical estimates are entirely misleading. These observations are preliminary to what we have to say of the prevalence of diseases by sections.

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[*] Geological and Natural Survey of North Carolina: Part III.—Botany, &c. By Rev. M. A. Curtis, D. D.

In general terms, we can say that malarial fever—that is, the paludal, or swamp fevers—abound in the Eastern sections, or region of the long-leaf pine—that is, less abundant in the Middle sections, finding its greatest intensity along the river and creek bottoms to the foot of the mountains, and that in the mountains malarial fever is not common. Almost the reverse of this applies to typhoid fever. Taking into account the difference in the density of the population—it being sparse in the mountain region, leaving out such centres as Asheville, and denser in the East, except on the immediate coast-line—typhoid fever not only finds its highest intensity in the mountain regions as to numbers, but also as to the essential violence of the disease. In the West we have a type of fever that is generally regarded as contagious by the people, as well as by the doctor; in the East not regarded as contagious in any degree. In the West typhoid is *the fever*, in the common parlance of the people; in the East, *the fever* is bilious intermittent or remittent, and in the East—certainly I can speak of Wilmington—typhoid is the fever of acclimation of the young German population.

Pneumonia is general, but more marked in the Middle and Western sections.

Dipththeria is all-but universal, but, like typhoid fever, abounds most in the Middle and Western sections. According to the digest of the Tenth Census, as represented, after the graphic method by Dr. Billings, we give the following: In the *East* the *deaths from diphtheria, as compared with the total deaths from all causes*, was under twenty per thousand, while in the Middle and West, 40 to 59 per thousand.

Croup is also given, upon the same authority, in the East, under twenty per thousand; Middle, 20 to 29 per thousand; West, 60 and over per thousand.

Diphtheria, by groups of counties, may be best understood by the following:

Group composed of Guilford, Randolph, Chatham and Harnett, 100 and over per thousand.

Group composed of Pitt and Greene, respectively, 60 to 79 per thousand, and 80 to 90 per thousand.

Group composed of Lincoln, Gaston and Burke, respectively, 100 and over for the former, and for the latter 80 to 99.

Group composed of Cumberland and Moore, 40 to 59 per thousand.

Group composed of Surry, Stokes, Yadkin and Forsyth, 80 to 99 per thousand.

Group composed of Cherokee, Clay, Graham, Macon, Watauga, Jackson, Swain, Transylvania, Henderson, Buncombe, Madison, Mitchell, Yancy, Caldwell, Alexander, Catawba, Iredell, Rowan, Mecklenburg, Stanly, Anson, Montgomery, Richmond, Robeson, Bladen, Sampson, Duplin, Pender, Onslow, Jones and New Hanover, in some degree contiguous and representing largely a lower tier of counties, had a mortality of 20 to 39 per thousand.

Single counties—Davie, Catawba, and Union—and a group composed of Granville, Franklin, Nash, Wilson, Edgecombe, Johnston, Halifax, Martin, Bertie, Beaufort, Lenoir and Craven, under 20 per thousand.

In these last-named counties occurred the minimum of diphtheria deaths. It will be observed that deaths from croup bore the same ratio to deaths from all causes, as in the case of diphtheria.

Scarlet Fever was not reported in any part of the State, and in the last decade the cases which have occurred in 1885, 1886, 1887 and 1888, were mostly reported in Wilmington.

Enteric Fever.—In the East, 35 to 44 per thousand; 45 to 54 per thousand in the West.

Malarial Fever.—In the East, 50 to 69 per thousand; 30 to 49 per thousand in the West.

Consumption.—In the East deaths are 75 to 99 per thousand; in the West, under 75 per thousand.

Heart-Disease and Dropsy.—Seventy and over in the East and West, and in the Middle 60 to 69 per thousand.

Diarrhœa Diseases.—Twenty to 39 per thousand in the East; 40 to 59 per thousand in the Middle; 60 to 79 per thousand in the West.

The *Birth-Rate* per thousand living in all sections is the same—30 to 59 per thousand—and corresponding with Virginia, Tennessee and South Carolina. The birth-rate per one thousand women, between 15 and 50 years of age, is 150 to 169, which corresponds with the States above named.

Deaths in Child-Birth.—In the East and Middle the deaths in childbirth are 15 to 19 per thousand, and under 10 per thousand in the West.

Still-Born.—As compared with total from known causes, in East, 15 to 19 per thousand; West and Middle, 25 to 30 per thousand.

Cancer.—In the East and Middle, 10 to 15 per thousand; in the West, 15 to 20; and this item of the causes of deaths sinks into insignificance as compared with the New England States.

Old Age.—Distribution, as compared with total deaths from known causes: In the East, under 10 per thousand; in the Middle, 10 to 14 per thousand; in the West, 15 to 19 per thousand.

It would be useless to attempt to generalize upon the summary above given, as the record is not full, and the reports made were not always intelligently done, but the general drift of diseases can be observed more intelligently with the data in view.

The record of consumption by towns we can give for nine months only. Nine towns gave in nine months the relative mortality from consumption, 40 whites to 81 blacks.

By months: In May the highest mortality attained among the blacks was 16; highest among the whites in November, 8; blacks 13; December, 6 whites, 6 blacks; October, 4 whites, 10 blacks; June, 5 whites, 6 blacks; May, 3 whites, 16 blacks; July, 6 whites, 2 blacks; April, 2 whites, 10 blacks; August, 3 whites, 6 blacks; September, 3 whites, 8 blacks.

The study of the movement of our population, the conditions of life, and the causes of death, will, for all future time, be the important directions in which the energies of our work must be urged. The difficulties are great, because very few students are to be found capable for the work, and no considerable impression has been made upon the people—certainly not upon the law-makers—as to the utility of it. This need in no way discourage us, for the road to success has been marked out by Chadwick in England, and all the followers of his lead in this country, and we must come to it, sooner or later. True education advances slowly, especially in our State, whose population is largely rural, and whose needs are far different from those denser communities where chiefly hygienic problems have been worked out at great cost. Thus, progress of time is bringing us face to face with some of the problems which have already been solved in older and denser communities, and at first thought we might believe that we would stand ready to adopt, with intense painstaking, the principles established by this well-earned experience. The signs of the times do not bear out this belief.

We observe in our towns that persons are trying the experiments with cess-pools, as though not a word of warning had ever been sounded on this subject. Persons building a new house, desirous of combining all the conveniences compactly to meet the requirements of our poor domestic service, catch at the idea of water-closets in the house, imitating the suggestion which has come to them in their travels, or being seduced by the ill-advice of some unwise architect or energetic plumber, never stopping to enquire how sewage is to be disposed of, finally accepting a veritable death-trap in a cess-pool. If this is bad in a country where they have freezing weather for three months in the year, what must it be where the temperature of river water goes up in the 80's, as in Wilmington, during July and August?

Hardly less fatal is the error of haphazard sewerage, which is undertaken in some of our towns. A town gets a water-supply; bath-rooms and water-closets multiply, and properly enough sewer pipes are laid to carry off the waste water and sewage. The sewer is undertaken by a few neighbors, the pipes are laid without ascertaining the correct levels, the pipes become choked, and the householder finds to his sorrow that he has got as good as a cess-pool at the end of his pipes, and then begins a series of expedients to obviate the difficulty, ending, if the householder be a man of common sense, in cutting off the abomination and returning to the primitive method of an old-fashioned privy out of doors. Rather than have a water-closet, with a cess-pool of faulty sewer as its receptacle, it would be better to do as they do in one of the mountain counties, where an old guide, well known in the Caney region, says that a privy, recently erected by Col. M., is the only one known to exist in that region, and there are no water-closets there either. These fatal mistakes are fast increasing in the State, and are far more serious than this sketch makes them.

This water-supply is fraught with many evils. Singularly enough, as I have many times pointed out, the necessity for a public water-supply does not come from the promptings of the needs of citizens, but from the trade pressure from without. It usually originates after some disastrous fire, in the high rate of insurance, caused by the lack of sufficient water. Having entered this wedge, the convenience of a tap in the kitchen and house, wherefrom water can be drawn at will, the convenience and luxury of baths, and the great cleanliness and niceness of water-closets, are argued, until the plain, old-fashioned folks, to whom all such things are novelties, are found to fall in with the suggestion, which, if traced to its origin, came from the numerous speculators who are engaged in the manufacture of material used in the construction of such works, generally known as "Pipe Trusts."

The original idea of having a public water-supply, which has by this time taken full possession of a steady-going, old-fashioned town, has been turned into the best use that the various contractors can make of it, and the innocent public stand off to see a warm encounter between committees of Aldermen and rival supply companies, resulting finally in the victory of the sharpest contractor; and then what? Why, the source of water-supply is to be decided by a partisan encounter, regardless of scientific investigation, or experience as to quality and quantity, and, it may be, the final selection of a water so doubtful that nothing better can be devised for it than to filter it.

It is not worth while to multiply the dangers which beset us—enough of them are actually upon us to test the manner and spirit in which other questions will be met. So far, we are deliberately repeating the early errors of the past century, which can only be accounted for by the inference that our people are not informed.

Just let us see how we are going to fare in the next ten years. All these towns, getting a supply of water, will have, after disastrous losses of life and health, a system of sewage. Then will come into our towns swarms of tramp plumbers, who are driven out of the cities where license laws are in vogue, and the work done in our houses will be shabby, expensive, and exasperating. After suffering innumerable ills, patiently, as our Southern people have by long hardships learned to endure, the public will wake up to the facts in the case. This is no sensational picture, and, indeed, is but half drawn.

Is it not clear, then, that the whole population is interested in the future of sanitary work in our State? It is not the physicians alone who are to inform themselves and take active measures for the mitigation of disease, the prolongation of life, and the comforts of our surroundings, but every man, woman and child has some interest at stake. It must be almost of necessity that the doctors will take the lead in public and private sanitary matters, because, by their education, they are generally better fitted to advise, but it is just as great folly to leave it all for them to do as it would be for an intelligent community to entrust its religious duties to their pastors, ministers, or priests. It is a common cause, and involves principles of self-protection—so much so that when one family neglects its hygienic duties, the errors do not fall alone upon the transgressors, but just as likely upon their unoffending neighbors.

It is proper, therefore, that efforts should be made to teach the principles of hygienics in our schools—not so much by text-books as orally, by the teachers who have studied and digested thorough systems of hygienics.

There is no time in our short public-school terms to take up a thoroughly good book, such as that by Dr. Ezra M. Hunt on "The Elements of Hygienics," so that the duty devolves upon the conscientious teacher to make his or her preparations to intersperse a lecture on hygienics into the monotonous curriculum. If these lectures do not degenerate into ill-judged temperance lectures, to the exclusion of sound doctrines on other points, it will be fruitful for good with some, at least, of the rising generation.

In conclusion, I would say that the future of preventive medicine or hygienics depends upon the education of the masses. If our mayors, for instance, happen to have no standard of cleanliness, and having only the example of their own town to measure their degree of sanitary duty by, and the masses of the people have no idea of hygienics, and have no good standard of cleanliness, there will be repeated, from century to century, the average condition of insanitariness so often seen in our towns—public places carefully policed, but the neighborhood of petty tax-payers on the suburbs made a dumping-ground for the garbage removed from these public places. How are these reforms to be complete?

I think we can foresee, in the not very distant future, the adoption of garbage furnaces. The people are going out in the world more and bringing back home ideas and impressions which they have gained by seeing the condition of other cities, and it will not be many years before they will demand more orderly streets, the destruction of garbage by burning, and the proper construction of sewerage, and the public functionary who is willing to go along repeating the errors of these hundred years past will be supplanted by more intelligent and progressive officers.

We must insist that public hygienics belongs to the people, and those of us who know the principles must make it our duty to impart them, and I can assure any one, be he citizen or citizen doctor, that the State Board of Health stands ready to aid any effort, however humble, to improve the sanitary condition of the people.

THE CONTAMINATION OF FOODS WITH METALLIC POISONS.

By F. P. Venable, Ph. D., F. C. S., Chapel Hill, N. C.

[Read before the Medical Society of the State of North Carolina, at Fayetteville, May 8, 1888.]

The purity and healthfulness of the food we eat is manifestly a question of paramount importance, yet comparatively little attention is paid to it. Liquid and solid foods are swallowed with a blind ignorance of, or a supreme indifference to, what they may contain. Unless the contamination is sufficient to make itself sensible to sight or smell or taste, we are apt to neglect it, forgetful how small an amount of some poisons can cause serious, if not fatal, results. Occasionally a newspaper account of some adulteration startles us from our equanamity, but the effect is not lasting, and we soon subside into our original condition of faith or recklessness.

It is true that our legislators sometimes try to turn the engine of the law upon the evil-doers who would tamper with food, but their wisdom is rarely sufficient to aim the legislation rightly, or properly to enforce it. Protection for the people cannot come by mere law-making alone, but by a general enlightenment as to food contamination, and by the establishment, at convenient points, of laboratories, manned by experts in inspection and analysis.

Many States have laws on adulteration of foods, some of which are laughably inefficient. Dr. Love makes the statement (Parke's Hygiene, Vol. II, p. 109) that "a majority of the acts aimed at the suppression of adulteration in particular articles make no provision for enforcing the law, and hence, nothing more is heard of them." This shows a lack of proper enlightenment on the subject. Our law-makers do not know, and cannot understand, what is needed.

Again, in several of the larger cities municipal laboratories have been established and have proved exceedingly valuable. Abundance of work has been found for them to do, and they have greatly aided in repressing fraud. For example, the Municipal Laboratory of Paris, capital city of the land of wine, examined, during ten months of 1881, 3,001 samples of wine, finding only 279 of them "good." The laboratories afforded a partial protection for the cities, but their multiplication must force those handling contaminated wares to dispose of them to the unsuspicious and unprotected farmers and dwellers in the small towns. It has seemed to me somewhat anomalous that fertilizer-control stations should be established all over the country, to analyze the food of the plants, whilst no one looks after the food of the farmer. Should there not be board of health laboratories to examine our water, milk, vegetables and groceries?

I can but briefly speak of some of the more common, and hence more dangerous, forms of food contamination, without entering upon the subject of adulteration in general. In many cases, doubtless, I will but remind you of facts you already know, but by bringing them afresh to your attention something may be done to stay the dangers which beset the people.

Food may be contaminated with metallic poisons accidentally, through ignorance or carelessness, or, secondly, intentionally. Some little instruction in the chemistry of every-day life in our public schools would largely do away with the first source of danger. Analytical experts alone could antagonize the second, and we cannot include intentional adulteration within the scope of this paper.

The principal poisonous metals occurring in food are copper, lead and zinc, and as to the exact physiological action and degree of danger from these, a variety of opinions seem to exist. Hassall calls them all cumulative poisons. This can only be true of some of them by extending the word cumulative to the effects resulting from their action. The system, for instance, is apparently capable of eliminating a little of the zinc compounds, but the derangement caused by frequently repeated small doses may so aggravate as to cause serious trouble.

The contamination of water with lead from the conducting pipes has been the object of so much attention that this danger is generally well guarded against, and will need no special mention in this paper. But there is a great and growing danger with regard to zinc salts getting into our drinking and cooking water, and to this I have already adverted in the NORTH CAROLINA MEDICAL JOURNAL, Vol. XIII, No. 5, p. 221. The use of zinc or zinc-lined vessels, for storing water, and of galvanized iron pipe in transporting it, is becoming more and more common. I have examined water thus brought through galvanized iron pipe a distance of 200 yards, and found 4.29 grains of zinc to the gallon.

Galvanized iron is iron coated over with zinc. It is well to state, also, that this zinc nearly always contains arsenic. In some localities milk is often kept in zinc or galvanized iron vessels. Such vessels are cheap, lasting, and, besides, have the effect of keeping the milk sweet a longer time than usual and adding about twelve per cent. to the amount of the cream. The explanation of these last actions is to be sought for in the neutralization of the acid, as fast as formed, by the zinc giving zinc lactate. From the presence of this acid such use of zinc is much more dangerous than in the storage of water.

If water and milk attack and dissolve zinc and lead when brought in contact with them, manifestly the solvent action is greatly increased in the case of distinctly acid foods, such as fruits and vegetables. We find in these especially acetic, tartaric, citric, malic and aspartic acids, sometimes uncombined, sometimes as partially saturated, and hence, still acid salts. These have strong solvent action on some metals, particularly if the process of oxidation is going on at the same time. Furthermore, meats which have been salted attack such metals, and where either the meat or the flavoring substance, as mustards or onions, contain sulphur, the action is increased.

Lastly, it must be borne in mind that fats are slowly saponified by these metals, glycerine being set free, and compounds called soaps or plasters formed between the metals and the acids of the fats.

Our ordinary articles of food may be contaminated during preparation or by storage. In preparing food in metallic vessels several agents aid in the solvent action. First, there is atmospheric oxygen, which is present in the water used in cooking; then we may mention acids such as vinegar and salt, soda and sugar. The metals are probably first attacked by the oxygen forming oxides, and these are brought into solution by the aid of the acids, salt, soda, (forming with lead, for instance, plumbate of soda,) or the sugar (forming saccharates). If cooking vessels, especially copper or brass, are scrupulously cleaned and brightened, freeing them from all oxide (or verdigris), just before using, and then the substances cooked in them removed as soon as the cooking is over, not allowing time for oxidation and solution, the danger of contamination is much lessened.

Copper and brass vessels are so convenient that their use is greatly extended, but it would be far better if the inside were freshly tinned every now and then. This precaution is taken by the Asiatics, who heat the copper above the melting point of tin, and then rub over the interior a piece of block-tin. Tin is attacked, but more slowly than the other metals, and forms less objectionable compounds. Unfortunately, much of the block-tin offered for sale is impure, having arsenic, antimony, lead and copper as its principal impurities, and cases of serious arsenical and lead poisoning have been noticed from the use of tin-lined vessels. Still, pure tin can be gotten, and even the impure is better than the unprotected copper or brass (which is an alloy of zinc and copper).

Metallic cooking vessels are often protected by a coating of glaze or enamel. The glazing generally employed is of two kinds—either it is composed of aluminium and potassium silicate, along with calcium phosphate or sulphate, or some similarly harmless materials that is glass enamel; or it is essentially lead-glass with a large proportion of lead. This lead-glass, as being easily fusible, very commonly forms the glaze on yellow and light-colored earthen-ware, which is used for baking-dishes, preserve-jars, milk-crocks, etc. Our ordinary glass table-ware is also lead-glass, generally, but contains less lead and is less easily attacked. It is maintained by some German authorities that even this is dangerous; so that the use of such glass is more common in England

and America than on the continent of Europe. Still, the food remains in contact with it so short a time that the danger can only be slight.

If the earthen-ware has not been properly baked the glaze is still more attacked. In " Muspratt's Chemistry" the statement is made that badly baked ware readily afforded indications of the presence of lead when digested with vinegar. Where these earthen-ware vessels are used for cooking, the lead-glaze becomes decidedly dangerous. Accum has written: "Pots of this kind of stone-ware are wholly unfit to contain jellies of fruits, marmalade and similar conserves. Pickles should in no case be deposited in cream-colored earthen-ware."

The reason for warning against this special color of earthen-ware is because it is usually made of materials which do not stand baking at a high temperature, and hence a more fusible glaze is applied to them.

Accum goes on to say: "The baking of fruit-tarts in cream-colored earthen-ware, and the salting and preserving of meat are no less objectionable. All kinds of food which contain free vegetable acids or saline preparations attack utensils covered with a glaze in the composition, of which lead enters as a component part."

The color in some of the enamels for metals has been mentioned as a source of danger. The cheaper colors that would probably be used, provided that lead-colors are excluded, would, I think, hardly be dangerous.

Frequently cooking vessels of tin-ware are used. Of the tin-ware itself I shall have more to say further on, but I wish now to mention the solder used on such vessels. This is made of lead and tin, and is sometimes present in considerable amounts in the joints of the tin-ware. The boiling of water alone in such vessels will cause the solution of some of the lead, and, of course, the acids of foods would dissolve still more. The ware should be formed of solid tin, without joints, when practicable. If solder must be there, the least amount necessary for the work should be used. Often it is possible so to turn the joint as to bring the solder on the outside. Of course this is much better.

Coming now to the storage of foods, we find occasionally zinc or galvanized iron used as for water and milk. The danger here has been pointed out. The use of glass jars is more common. These should be made not of flint or lead, but of ordinary soda or calcium glass (called "window" or "crown" glass). These should be also entirely of glass. Often we see them with zinc tops or covers which are screwed down upon the contents. In Parke's Hygiene, Vol. II, p. 514, a case is reported where serious sickness attended the use of cherries preserved in such a jar. It was found that these cherries contained a small amount of zinc, whereas the same amount of fruit preserved in jars with glass covers did not contain the metal. The sickness in this case may or may not have been due to the zinc, but the fact of the contamination, and, at least, probable danger from it, remains.

By far, the most common article used for storing food is tin. The use of this in the cans for fruit, vegetables and meats, and the buckets for lard, oil, etc., is enormous. I have been unable to find out from the census reports the exact amount of tin-ware used in this way in the United States, but as the tin is mainly imported and bears a duty-tax of between $5,000,000 and $6,000,000 (which it has been proposed in the present Congress to double), the value of the ware must be many millions.

As each can has the value of a few cents only, their total number is something incredible. In the census of 1880 the value of fruits and vegetables alone, "canned and preserved," is given as $17,599,576; and the industry is growing rapidly. I see it announced in the papers that our Agent of Immigration is making arragements for the establishment of forty canneries in this State.

Tinware is made by dipping sheet-iron, or thin sheets of steel, into melted tin, securing thus a protective coating over the former metal. There are two grades of tin-ware—that in which the coating is of fairly pure tin; and, secondly, that in which, to cheapen the product, the tin has a large admixture of lead. This is known as terne-plate. The first has a bright appearance; the second is heavier and of a duller appearance. The same two grades are seen in tin-foil also.

If, as is required by the French Government, the tin cans are made of the first grade ware, and the soldering is done either with pure tin or on the outside, the only possible contamination must come from the tin itself. If terne-plate is used, and special care is not taken, tin and lead, from both can and solder, and zinc chloride from the latter, may be present in the contents of the can. A solution of zinc chloride is the common soldering fluid, and its detection in canned goods has been reported by Battershall. Even with pure tin, the careless and excessive use of solder is frequently a source of danger, as lumps of the solder break off and are taken into the stomach along with the food.

Battershall ("Food Adulteration and its Detection," p. 225,) records the examination of 109 samples of canned goods, 97 of which contained tin, 39 copper, 4 zinc, and 2 lead. The copper was introduced by the preparation, in copper vessels before canning, or was intentionally added as $CuSO_4$, to give a green color, as in peas, pickles, etc. The small number of samples found to contain lead showed that the terne-plate is not much used in making cans. Indeed, Hall (*American Chemical Journal*, Vol. IV., p. 440,) states that he has tested cans from various sources and not once did he find enough to show intentional adulteration. The leaded tin, or terne-plate is too heavy and dull-looking for ordinary use in cans, though it is largely used in roofing, and so can easily come in cistern water caught from such roofs. In the Michigan Board of Health Report for 1878 (page 19), however, analyses of tinware are given, in which lead in appreciable, and even considerable amount was always found.

Hall also gives some analyses of tin-foil, which is so much used as a covering for such food as chocolate, yeast, cheese, confections, and the like. Out of eight samples analyzed, four contained about 75 per cent. of lead. The high price of the article enclosed seemed by no means to insure a pure tin covering. Cheese, as it contains acid, or so easily forms it, should certainly not be enclosed in tin-foil.

Of course, other things being equal, the longer the vegetable or fruit acids are left in contact with the tin, the greater will be amount of metal dissolved. The contents of some cans examined have contained as much as four grains per quart. Now, while no injury seems to result from small doses of tin, and it does not seem to accumulate in the system, large doses must be prejudicial. It would be advisable, then, to have all cans stamped with the year in which they were put up. The assurance of the healthfulness of canned goods, after being kept a few years, is not great.

The canning of foods has formed one of our most important discoveries, and has greatly added to the comforts of modern life. I would by no means decry the use of canned goods; and tinware seems at present essential to their cheapness. But the people should be instructed as to the possible dangers in their use. Special warning should be given, however, against leaving fruit or vegetables in the opened cans, as the action on the metals is very rapid, after air is once admitted.

Within the limits of this paper it would be impracticable to give all the possible contaminations of foods with metals—the more usual have been recounted. The less common—as, for instance, the case of the baker, mentioned by Blyth (Poisons, page 565), who used old painted wood in the fire of his oven, and so covered his loaves with the dust of lead-oxide and poisoned sixty-six persons—must be passed by. Nor can we enter upon the fraudulent, intentional addition of metals to foods. Such are to be looked for wherever man's greed and dishonesty can find opportunity.

To the physiological chemist and the physician I leave the discussion of the degree of danger from the presence of these various metals in the ordinary articles of our food.

A PRELIMINARY REPORT ON THE ANALYSES OF QUININE, BISMUTH AND LAUDANUM, TO DETERMINE THE ADULTERATION OR IMPURITIES.

BY PROF. F. P. VENABLE, PH. D., F. C. S.

CITRATE OF IRON AND QUININE.

Should contain 12 per cent. quinine.

Sample No. 1 contained 6.0 p. c. quinine.
Sample No. 2 contained 13.5 p. c. quinine. Good.
Sample No. 3 contained 10.0 p. c. quinine.
Sample No. 4 contained 11.9 p. c. quinine. Good.

BISMUTH SUBNITRATE.

Sample No. 1 contained slight trace of lead.

Sample No. 2 contained trace lead, carbonates in considerable amount, small amount chlorides and sulphates.

Sample No. 3 contained carbonates in considerable amount.

Sample No. 4 contained sulphates in trace. Good.

Sample No. 5 contained carbonates in small amount; sulphates considerable.

Sample No. 6 contained carbonates in small amount; sulphates considerable.

Sample No. 7 contained carbonates and sulphates in considerable amount, chlorides in small amount, arsenic in trace.

Sample No. 8 contained chlorides and sulphates in small amount. Good.

Sample No. 9 contained trace of lead.

Sample No. 10 contained carbonates and chlorides in considerable amount; sulphates small.

Sample No. 11 contained chlorides and sulphates in considerable amount; carbonates small.

SULPHATE OF QUININE.

	Cinchonidine, etc.
Sample No. 1 contained p. c. H_2O, 12.96, p. c. quin. sulph., 83.48,	3.56
Sample No. 2 contained p. c. H_2O, 7.30, p. c. quin. sulph., 86.73,	5.97
Sample No. 3 contained p. c. H_2O, 11.40, p. c. quin. sulph., 83.16,	5.44
Sample No. 4 contained p. c. H_2O, 14.22, p. c. quin. sulph., 80.99,	4.79
Sample No. 5 contained p. c. H_2O, 8.15, p. c. quin. sulph., 83.88,	7.97
Sample No. 6 contained p. c. H_2O, 6.34, p. c. quin. sulph., 84.58,	9.08
Sample No. 7 contained p. c. H_2O, 7.50, p. c. quin. sulph., 84.80,	7.70
Sample No. 8 contained p. c. H_2O, 6.12, p. c. quin. sulph., 85.32,	8.56

Laudanum.	Alcohol by volume.	Extract in 100 c. c.	p. c. Morphia.
Sample No. 1 contained	45	4.53	.18
Sample No. 2 contained	18	1.71	.13
Sample No. 3 contained	47	3.91	.22
Sample No. 4 contained	46.	3.71	.18
Sample No. 5 contained	45.	4.27	.15
Sample No. 6 contained	33.	4.32	.19
Sample No. 7 contained	44.	4.87	.17
Analyses of English Laudanum in 1882, by Woodland, gave		5.01—3.21	.70—32.

In the above the p. c. alcohol should, according to Pharmacop., be about 45. The extract shows well in four cases out of seven. The morphine is very low. I have no American analyses with which to compare it.

GROCERS LAUDANUM.

Sample No. 1 contained 36. p. c. alcohol.
Sample No. 2 contained 43. p. c. alcohol.
Sample No. 3 contained 27. p. c. alcohol.
Sample No. 4 contained 38 p. c. alcohol.

These samples (*Grocers Laudanum*) were too small in amount for proper determination of anything more than alcohol. With one exception they were less than one ounce—¾ ounces at least should be provided for thorough work.

In the samples of *quinine sulphate* the first four would be classed as good; the last four are fair. The range of cinchonidine, etc., in pure quinine sulphate is about 6 per cent.

In the *bismuth subnitrate* samples traces of certain impurities are to be expected. Those reported as "in considerable amount" were in quantities too large for a good article. Even traces of lead and arsenic must be prejudicial.

[NOTE BY THE SECRETARY, ON THE ADULTERATION OF DRUGS.]

Very little attention has been paid by our people to the adulterations and impurities of drugs or food-substances, notwithstanding the fact that it is generally known that a provision was made by the General Assembly, some years ago, with a view of affording the opportunity. Prof. Venable kindly undertook to make analyses, as his time allowed, to inaugurate an inquiry into the adulteration or impurities of some of the medicines in common use, and to continue the work as he could afford the time in the future. The number of analyses is small, but it was deemed of sufficient importance to publish. The names of the dealers and manufacturers are not given, the articles being duly numbered and recorded. This course was deemed the wisest, as the responsibility of dispensing impure drugs may not rest entirely with the druggist, the dealer himself many times being as anxious as any one to know what articles prepared for him by the chemist are not reliable.

Bismuth, quinine and laudanum being of such universal use, were selected, and it is very interesting to note how far they vary from the standard laid down by the Pharmacopœia of the United States.

With the light these few analyses now give us, doubtless the field is one which will yield good results, both for the dealers and the consumers. The Secretary desires to add, that these samples were purchased in the open market from Wilmington, Washington, Raleigh, Winston, Durham and Chapel Hill, and that he hopes to be able to get samples from all the larger towns in the State the coming year.

THE SEWERAGE OF CITIES AND TOWNS.

By J. L. Ludlow, C. E., M. S., Member N. C. Board of Health, Civil and Sanitary Engineer, Winston, N. C.

"We live or we die, live well or miserably; live our full term or perish prematurely—according as we shall wisely or otherwise determine."

Dr. Henry Maccormac has left this trueism as a monument to his superior intelligence, and to his studied appreciation of the perfect development of nature, as designed in Divine creation when it was given to mankind to enjoy or abuse, a free agency of the effects of creation and the natural laws thereof.

The various diseases by which humanity is enfeebled, both bodily and mentally—languishes in most intense suffering, and brought to premature death—are not our natural heritage, but the perversion of a glorious heritage by man's abuse and neglect of the laws and demands of nature.

Baldwin Latham, the eminent English sanitarian, says: "To those who have carefully studied the physiology of animal life, it will be clear that life and health depend upon rightly understanding and practicing those laws which constitute sanitary science." Hippocrates long ago formulated the cardinal principle of sanitary science and hygiene as the maintenance of "pure air, pure water and pure soil." It is for the preservation of these natural elements that a sewerage system, and other sanitary measures, become a necessity in cities, towns and villages where life and health are fully appreciated, and our natural heritage would be protected. This natural heritage may be described in the language of Dr. Stephen Smith: " Man is born to health and longevity; disease is abnormal, and death, except from old age, is accidental; and both are preventable by human agencies."

Diphtheria makes dark and desolate the former joyous and happy home by taking away the joy and boundless pleasure-producing jewels—the innocent children. Typhoid fever takes the life of a citizen in the prime of manhood, with all his wealth-producing powers fully developed. An epidemic of scarlet fever, yellow fever, typhoid, diphtheria, disentery, or some other of the preventable diseases, multiplies desolate homes, intense suffering and premature deaths, and we raise our hands in horror and wonder how a kind and loving Providence can inflict such a calamity upon our religious and worshipful community. By thus relieving ourselves in sentimentality we may restore the equilibrium of a guilty conscience, but we utter the rankest blasphemy against the Divine Creator and His well defined laws. We are the cause of the epidemic. We are the guilty ones. It is the criminal disregard of the laws of nature that causes this preventive sickness and premature death of our fellow man, and it is we, ourselves, who must carry the moral responsibility.

Self-preservation is the first desire of all life—from the lowest organism to the crowning monument of creating mankind. There is a universal longing and effort to this end, and there is much proof to demonstrate that this is likewise a *duty* imposed by the Creator. The Mosaic dispensation clearly illustrates this fact, and likewise demonstrates the universally proven and accepted maxim, that cleanliness of a community is the first law of self-preservation—the preservation of man's natural heritage of health and longevity.

With the advanced knowledge of the law of cause and effect, resulting from the sanitarian's scientific study and investigation, and with the results of sanitary measures before us, we cannot, as intelligent people, attribute the consequences of our own neglect and carelessness to a providential cause. We must recognize that a large proportion of the diseases which are inflicted upon humanity are the effects of preventable causes, and that it is possible, through the medium of sanitary measures, to so reduce the death-rate as to materially increase the average duration of life.

The alchemist of old expended his time in search of a hidden substance of nature, which he supposed to exist, and to be, in fact, an elixir of life, supposing, with much reason, that there existed some subtle force of nature which, if utilized, would prove to be a panacea for all the ills to which he reasoned that man was the natural heir. Had he reversed *his* law of nature, and followed the *true natural* law, he would have found that flesh is not heir to disease, but that disease is the heir to the violations of nature's laws in the flesh, and readily found his elixir of youth in these same sanitary measures which the student in sanitary science and the preservation of human life teaches us to observe and diligently practice.

The romantic Ponce de Leon, when he left the crowded metropolis of Spain and sailed across the ocean to an unknown and uninhabited country, in search of the fountain of perpetual youth, acted with some reason. From a city, where pure air, pure water and pure soil had been destroyed by the unnatural accumulations of filth and uncleanness—a very hot-bed of disease and death—to God's own free, fair and unpolluted country, where naught had yet come to destroy the life-giving and life-sustaining elements of pure air, water, and soil, was indeed to find a fountain of perpetual youth, for who can gainsay that fifteen years added to the average life is not at least as if to transform age to youth?

This same fountain of youth is ours but for the taking of it. Would we enjoy it in congregated communities of cities and towns, to which we are wont to repair? Then but remember that public filth is public disgrace, and that sickness and death is the natural consequence of the abuse of nature's laws ; but public cleanliness is public honor, and the practice of sanitary measures is to secure intellectuality, advanced civilization and achievements, health, happiness, and longevity. To maintain this public cleanliness, provision must be made for the preservation of the natural elements of pure air, pure water, and pure soil, by at once removing the effete substances of the body, and all other filth, to points remote from the community, by the construction of a sanitary system of sewerage, and practicing other sanitary measures in conjunction therewith. Without this provision, the natural soil will become foul and polluted, and, in time, totally unfit for human habitation.

Would you not leave to your posterity the city, town or village abounding in filth, disease and premature death, with all their train of unhappiness, pauperism, crime, enfeebled mind and body, and a degenerated civilization? Then have a care how you carry on the process of soil-pollution; for, when the soil becomes impure the air becomes likewise impure by the foul emanations from the soil; the water is also polluted by absorption from the air and transfusion from the soil; and you have flagrantly disregarded the cardinal principle of sanitary science and nature's laws, and sickness, epidemics and premature death is the natural result. But the soil, you say, is a purifier of filth. It is, but this property of the soil is limited. By constant absorption of impurities the soil is overloaded and itself becomes impure, and it is no longer a purifier, but a polluter, in the effort to purify itself. Behold and beware of the sad history of Rome, once the proud metropolis and centre of civilization of the world, but now a plague-stricken city for several months of each year.

Ancient Rome, under the rule of the Pagan Kings, had her Cloaca, Maxima and other sewers, which ramified the entire city. Massive baths, acqueducts and the accompanying sanitary measures maintained her cleanliness, and the observance of nature's laws, enabling her to be a grand metropolis of health, wealth and power. But, with the fall of Rome, we find the necessity of sanitary provisions lost sight of or unheeded, and the more modern Rome destroying the sewers, tearing down the massive baths and aqueducts to build churches and monasteries, totally disregarding the accumulated nastiness of the years during the fall and recuperation. Until to-day, christian Rome, with her glorious heritage of past achievements, having permitted these sanitary works to pass into decay, has many pages of her more modern history blackened by the most horrifying accounts of terrible scourges of plague and epidemics, paying the natural penalty of soil-pollution, as the most deadly and dangerous plague-spot that has ever blotted creation.

Under the present regime, Rome is again giving due attention to sanitary measures, and the death-rate is being gradually reduced, and the deadly Roman fever is being rapidly obliterated.

If we investigate any age or any people of which history records the advancement of civilization, art and science to any degree of refinement and excellence, we find that the importance of sanitary measures were fully appreciated and invariably adopted. Thus, in Alexandria, Carthage, Herculaneum, Jerusalem, Ninevah, all had their complete systems of sewerage and water-supply. Under the Mosaic dispensation, all sanitary laws then known were religiously observed, and we find that the Jews had a clear knowledge of the necessity of removing all effete substances and filth from within and about their habitations. The duty and necessity of observing and practising these laws of nature against soil-pollution was a prominent part of the inspiration to Moses, when pursuing the Divine task of leading the Hebrew tribes out of the wilderness of death and destruction. The devout adherence of the Jews to the practice of the sanitary laws prescribed by Moses has given to that race to enjoy greater health and vigor, even to the present day, than any other race of people on the face of the earth, in similar circumstances.

As we advance in history to the middle or dark ages, we find that the importance of sanitary measures, which had characterized the Jews and the Rome of the Pagan Kings, was entirely lost sight of, and the statute books bore no trace of these important laws, the first in importance for the preservation and promotion of advanced civilization and refinement. With this decline, there is recorded a parallel decline in art, science and civilization. Beyond question, enlightenment and sanitation are inseparable companions—the advancement of the one requires the advancement of the other.

For the thousand years preceding the protest of Luther, that cardinal law of christianity, that "cleanliness is next to godliness," was completely disregarded, and filth, by force of circumstances, was sanctioned by the influence of the Christian church. The Christian outlaws of Pagan Rome, to maintain their faith, were forced to seek refuge from their persecutors in the dark and filthy catacombs beneath the city, and filth and unclean personal appearance became a measure of the sanctity and personal sacrifice for their Christian faith. Through this cause the importance of cleanly surroundings was wholly lost sight of. But the laws of nature could not be defied, even for such a good cause, without impunity, and as this neglect extended from person to community, from community to city, there came, in due time, the inevitable result. Outraged nature aroused them from their insanitary neglect by the natural consequence of pestilence in various forms visited upon these disregardants of nature's laws. Epidemics of plague, typhus and cholera devastated Europe from the 14th to the 17th centuries, much more terrible in fatal results than was ever caused by the most bitter warfare in history. England in twenty-two (22) years of continuous warfare lost 79,700 lives, but in one (1) year alone cholera robbed her of 144,860 lives.

During the prevalence of the plague at York, in 1664, there was one

(1) death to every three (3) persons living, but during the cholera epidemic of 1832 there was one (1) death to each 142 persons living, an improvement directly traceable, by the resurrected city archives, to the improved sewerage and drainage of the city. In the year following the city of London is supposed to have lost 75,000 lives by her last visitation of the plague, Black Death, as it has been called.

The history of the town of Chester furnishes another lesson of the fearful results attending the utter neglect of sanitary precautions which characterized the degenerate civilization of the middle ages. Of this we have the following record:

"In 1507 sweating sickness was very severe in Chester for three days; ninety-one died. In 1517, great plague; grass a foot high in the streets. 1550, sweating sickness. 1603, great plague; sixty died weekly, in all 650 persons. 1604, plague; 812 deaths. 1605, plague still increasing; 1,303 deaths. In 1649, 2,099 persons died of the plague."

Such was the inevitable result of the disregard of nature's laws for self-preservation, "pure air, pure water and pure soil." These unfortunate people, in their blind ignorance, charged all their mysterious sickness and deaths to Divine Providence, as some are inclined to do even in this enlightened era, but forgot their garbage heaps, foul streets, dirty houses, personal uncleanness and their total lack of sanitary provisions. Ignorance cannot be plead in mitigation of violations of civil law, much less in physical laws of nature. Nature's laws were made unchangeable for all time, irradicable as creation itself. "God never breaks His laws; He never permits them to be violated with impunity. They operate in the material universe with inevitable accuracy."

Gladly do I turn from this sad history of the past to the more cheerful task of recording the benefits that have been derived from the practicing of sanitary measures, but this pleasure is checked by the thought that, even in the brilliant enlightenment of our present century, the lessons of the past have been but poorly learned. We have had—and even now are having—black spots in our own country; our New Orleans, our Memphis, our Jacksonville epidemics, and many others of greater or less magnitude. It behooves us, as a country and as a State of enlightened people, that these terrible lessons be not passed over lightly and unheeded. By the epidemics of New Orleans, in 1853, there were 5,122 deaths from yellow fever, with a total of 7,000 deaths from all diseases. In one day—August 22—the deaths from yellow fever numbered 239. This great number of deaths were recorded, and it is generally believed that there were many deaths, also, which were not recorded. Of the condition of the city at the time of the outbreak of the epidemic, we are told that the streets were reeking with filth, and miasmic odors prevailed throughout the city, caused by the decomposing animal and vegetable matter that had been scattered promiscuously throughout the city. Everything had, of custom, been thrown into the streets that the inhabitants desired to be rid of, and lay there, seething and rotting. The canals and their tributaries, and the city drains as well, were covered with a green slime so completely that the water was entirely hidden from view. In the pools were dead animals floating about, with every other description of animal decomposition. It was by this wretched insanitary condition that the seeds of epidemic were united and developed, with such disastrous results in the loss of human life. Yellow fever, and kindred maladies, were more or less prevalent in the city till 1862, when active sanitary measures were put into effect. The drains were cleaned out; the streets were scraped, swept and washed of all deleterious matter; the canals and their tributaries were cleansed of their germ-festering scum; stringent orders were issued against throwing any filth, or decaying vegetable or animal matter, in the streets or open courts; all refuse matter was required to be placed in proper receptacles and was then promptly removed without the city and disinfected; every household was required to clean up its premises and keep them clean. The entire city was placed in as thorough sanitary condition as the location and local conditions would permit. The gratifying result of this was, that not one of the 160,000 inhabitants, or the many thousand of totally unacclimated troops, was stricken with yellow fever during that year. These sanitary measures had so improved the general healthfulness of the city that, for the summer of 1862, New Orleans is said to have shown a less rate of mortality than any other city in the country. These results were continuous, and, with this as a beginning, the city entered upon a new era of substantial freedom from epidemic and malarious diseases. They exchanged spoons for health. How can we appreciate the enormous, immeasurable benefits accruing to the city of these sanitary measures?

The financial loss by the yellow fever epidemic of 1853 may be closely approximated as follows: 5,122 lives, at $1,000 each (which is a minimum estimate), amounts to $5,122,000; estimating five cases of sickness to each death (the Jacksonville epidemic shows ten cases to each death), the cost of which, including loss of time, medical attendance and nursing at a low estimate, would be $40 each, or $1,024,400, making a total of $6,146,400.

The city of Memphis, Tennessee, disregarding the valuable lesson taught by this short page of the history of New Orleans, scrupulously neglected all sanitary measures. The streets had been allowed to become filth-channels. The soil of the city was permitted to become not unlike a vast compost heap, through the lack of a sewerage system to remove the filth, instead of carrying on the continued process of soil-pollution. The laws of nature had been totally diregarded and violated, with the consequences that we have been taught by the history of centuries, even from the time of Moses, to be inevitable.

In 1878 we see Memphis visited by a terrible epdemic of yellow fever, with a fatality almost unparalleled. The commerce of the city was entirely suspended, thousands of the inhabitants were dead and dying, and many others making every effort to desert the city. The city government was bankrupted and disbanded, demoralization and panic were general throughout the city, until cold weather came and put a check upon the ravages of the dreaded yellow visitor. In the meantime, 5,022 persons had lost their lives by the criminal negligence of those in authority over the sanitary and general condition of the city.

Only after this costly lesson was the city induced to seek relief by complying with the lawful demands of nature through the practice of sanitary measures. A sanitary system of sewerage was adopted and executed with scientific skill and efficiency. Other sanitary reforms, made possible and efficient by the construction of sewers, were put into practice, with the gratifying results best told in the decreased mortality and absence of epidemics since these measures were executed. * * *

Under the former condition of the city, the annual death-rate per 1,000 inhabitants was 109, while under the present regime, as shown by the statistics of 1887, it has been reduced to 23.56 per 1,000. With the changed sanitary condition seemed to come a new confidence and interest in life. New vigor and energy characterized the inhabitants of the city, and its healthfulness attracted immigration, with a consequent great increase in industrial and commercial importance, and an increased population from 33,592 in 1880, to 65,000 in 1888.

The financial value of this increased prosperity can hardly be estimated, at least the proportion due to the changed sanitary condition. We can, however, demonstrate a great financial saving in human life and healthfulness alone, directly due to the sanitary measures put into practice.

The average population for the years from 1880 to 1888 has been in round numbers, 45,000. The average death-rate reduction may safely be placed at 50 per 1,000 inhabitants, or a total saving of 2,250 lives annually. At the least valuation placed upon a human life in the United States, this saving of life would amount to $2,250,000 annually. The number of cases of sickness likewise prevented may be safely estimated at eight to each death, making 18,000, the cost of which, including loss of time, medical attendance, and nursing at $50 each, would have been $900,000. These two items make a total annual saving of $3,150,000.

Estimating six per cent. upon the cost of the sewerage system, and adding the annual expense of carrying on the work of the very excellent city Board of Health, makes a total annual expenditure of $36,337.86 to effect this enormous annual saving of human life—in money value only.

The epidemic of yellow fever at Jacksonville, Fla., and other southern towns during the past year, is but further results of the lack of sanitary measures. In all the towns where this epidemic secured any foothold, it can safely be asserted that little or no attention had been previously given to their sanitary condition. These communities were living amidst the accumulations of their own filth, with utter disregard to the natural law against air, water and soil pollution. The inevitable result was a severe epidemic, with all its train of moral, physical and financial loss. Hundreds were suffering the most intense agony, and premature deaths were numbered by the score before sanitary measures were apparently thought of. But, when such an epidemic has already settled upon a community, it is then too late to prevent the damages by any hygienic means. This should be effected before the outbreak to render a full return. Though it is happily conspicuous of the epidemic at Jacksonville, that, owing to the efforts of the Sanitary Committee and Board of Health, and the greater knowledge of its treatment by the medical profession, the rate of fatality has been reduced to one (1) death to ten (10) cases of sickness, and the extent of the epidemic has been comparatively very limited—the number of cases having been 4,700. But when the seeds of such epidemics have once found a suitable locality for development and growth, their destructive effect is beyond the control of human agency. From the history of New Orleans, Memphis and Jacksonville, it seems to be clearly deduced that a yellow fever epidemic, like every other, may be prevented by the practice of sanitary measures. But, when the prevention is not applied, and a foothold is obtained, cold weather alone can check its ravages.

Dr. Morris H. Henry, a prominent expert on the origin and treatment of yellow fever, recently speaking of the Florida epidemic, has this to say regarding the intimate relation of disease and death with insanitation and unclean surroundings: "The popular idea of yellow-fever is, that its presence is accidental. * * * Yellow fever is no more the result of accident than were the plagues of the East or the great plague of London. The plague of London was not a punishment from Divine Providence. It was a natural sequence of the absence of all sanitary laws, and the failure to adopt any prophylactic measures to prevent the spread of what are now known, in plain Anglo-Saxton, as *filth diseases.*"

BENEFICIAL RESULTS FROM SANITATION.

Illustrating the reduction of disease and mortality of towns and cities, due directly to the construction of efficient systems of sewerage, I will first quote Sir Douglass Galton, K. C. B., F. R. S., an eminent English sanitarian, in an address before the Sanitary Institute of Great Britian: "It may be accepted as certain that in every case where the sewerage of towns has been devised in sound principles, and where the works have been carried on under intelligent supervision, a largely reduced death-rate has invariably followed. The records of Newcastle afford evidence of this fact. The quinquennial period ending in 1881 showed a death-rate of twenty-three per 1,000, whilst the death-rate of 1881, after the completion of the system of sewerage, was only twenty-one per 1,000."

"At Munich the typhoid fever mortality per 10,000 inhabitants per quinquennial period was as follows:

From 1860 to 1865, when there was no sewerage system	16.8
From 1866 to 1873, when there was partial sewerage system	13.3
From 1875 to 1880, when the sewerage system was complete	8.7

"Similarly, at Frankfort-on-Main, the deaths from typhoid fever per 10,000 inhabitants were:

From 1854 to 1859, when there was no sewerage system	8.7
From 1875 to 1887, when the sewerage system was complete	2.4

"At Dantzic the figures present some striking characteristics; the deaths from typhoid fever per 100,000 *living* was as follows:

From 1865 to 1869, when there was no sewerage or water-supply	108
From 1871 to 1875, after the introduction of water-supply	90
From 1876 to 1880, after the completion of a sewerage system	18

"At Hamburg, the deaths per 1.000 of total population were :

1838 to 1844, before the commencement of the construction of sewerage works	48.5
1871 to 1880, after the completion of the sewerage works	13.3

"During the time that the works were in progress, viz.: from 1872 to 1874, the mortality from typhoid was a follows:

In the unsewered districts	40.0
In the districts for the most part sewered	32.0
In the fully-sewered districts	26.8

Dr. Buchanan, as "Medical Officer of the Privy Council" of England, in the ninth report, has shown the marked improvement to health following the introduction of systems of sewerage and water-supply in twenty-five cities and towns, with an aggregate population of 593,736 persons.

This report shows the effects of providing for the purity of the air, water and soil of towns, by providing water from an uncontaminated source, and by the prompt removal of all effete and refuse matter before putrefaction and soil-pollution could take place, by a reduction of 24 per cent. in the mortality of typhoid fever alone. Dr. C. W. Chancellor, Secretary of the Maryland Board of Health, and a thorough sanitarian, states in his "Report on Improved Methods of Sewerage Disposal and Water-Supplies," (from which these quotations are taken), that it is fair to presume that diphtheria and other gymotic miasmatic fevers would be similarly affected.

Concerning the benefits derived in England, during the period from 1870 to 1880, from sanitary measures, the Local Government Board, in their report, speaks as follows:

"On the demonstration of various model instances, it may be held that the reduction of the general death-rate by 4½ per cent., as reported, satisfactory as this is, cannot be considered more than *one-third* of the results obtainable by advanced sanitary administrations and further sanitary works. The pain and misery and the social disorder occasioned by excessive sickness and premature mortality are greatly beyond pecuniary estimation."

Mr. Baldwin Latham, the eminent English engineer and sanitarian, in his work on "Sanitary Engineering," gives tabulated results, in the annual death-rate reduction per 1,000 inhabitants, following the introduction of systems of sewerage in various English towns and cities, from which the following list is taken:

Banbury—	population	10,000;	death-rate	reduction	23.4 to 20.5—12½	per ct.
Cardiff—	"	33,000;	"	"	33.2 to 22.6—32	per ct.
Crayden—	"	30,000;	"	"	23.7 to 18.6—22	per ct.
Ely—	"	8,000;	"	"	23.9 to 20.5—14	per ct.
Wacclesfield—	"	27,000;	"	"	29.8 to 23.7—20	per ct.
Newport—	"	25,000;	"	"	31.8 to 21.6—32	per ct.
Salisbury—	"	9,000;	"	"	27.5 to 21.9—20	per ct.

Unfortunately, the lack of statistical records of American towns and cities precludes the possibility of illustrating as fully the advantages of sanitation in our own country. Yet the fragmentary data that has been compiled shows equally or greater gratifying results than the above showing for European towns and cities. The statement will pass unchallenged, that in any American town or city, where any attention whatever has been given to sanitary measures, greatly reduced sickness and mortality among the inhabitants has been the result.

The city of St. Louis, Missouri, furnishes an average specimen of the benefits to be derived from the construction of sanitary works. In 1860, when the city had given little or no attention to sanitation, the annual death-rate was 32 per 1,000. This extreme rate of mortality continued until the year 1865. During 1865–'70, a proper sewerage system was constructed, and accompanying sanitary reforms were put in operation, with the result that the death-rate in 1870 was 20 per 1,000 inhabitants—a saving of twelve human lives and 120 cases of preventable sickness in each thousand of the city's population. The population of St. Louis, in 1870, 310,864; in 1860, 160,773. The average population from 1865 to 1870 may be taken at 298,341. Thus we have, as the result of the sanitary works, the saving of 298.34+12, or 3,580 human lives and the prevention of 35,800 cases of sickness annually. The financial value to the city of these results is shown by the following estimate, based upon minimum values:

3,580 human lives at $1,000	$3,580,000
35,800 cases of prevented sickness at $50	1,790,000
Total annual saving of	$5,370,000

In the foregoing pages I have endeavored to clearly show the evil results of sanitary neglect, and the varied and positive benefits to be derived from the practice of sanitary measures. I have also endeavored to demonstrate that the essence of all sanitation is the maintenance of pure air, pure water, and pure soil in and about the habitations of man. Now, the question will naturally arise, How can these elements be preserved in their primeval purity, and what are the constituent features of sanitation as regards this object? Of these three elements, the one directly requiring the most of human agency is the soil.

It is but feebly realized what an important part the soil performs in providing health and happiness to our lives. Upon this very largely, if not wholly, depends the purity of the air and water. Polluted soil means polluted water and impure air. If we preserve the purity of the soil, the air and water will retain their purity.

The soil is the medium by which nature transforms the waste product of animal life into vegetable life. Nature has provided that when any of her agents, whether it be air, water or food, has once served the purpose of sustaining animal life, that it becomes totally unfit for its further promotion, without another transformation—becomes, in fact, destructive to animal existence; but, through this very process, these agents have lost that which is detrimental to vegetable life in furnishing the combustion of the animal kingdom; they are then prepared for the support of vegetable life, and by vegetable growth the chemical combinations are made which causes this inert matter to become again prepared for the nourishment of man and animals. The vegetable kingdom requires for its support that which forms the waste product of the animal kingdom. It utilizes these, and renders a product again suitable for the healthful use of the animal kingdom. Such is the cycle of the subtle forces of nature in a grand development. While the atmosphere plays quite an important part in this process, the first few feet of the soil is the grand laboratory where the chemical disintegrations and combinations are effected. Consequently, when the soil is polluted by accumulations of filth, this transformation is carried on in order that the soil may again purify itself. This process of transformation of matter has, either as an agent or as a result, the development of low forms of microscopic life, known as bacteria, in direct proportion to the amount of filth with which the soil is charged. These minute organisms play a large part in the processes of the organic world, and have direct relation to many of the common diseases. And it has been clearly demonstrated that most all, if not every one, of the infectious and contagious diseases are directly produced by, and dependent upon specific forms of these micro-organisms; that these minute organisms, developed in the decomposition of filth, are the direct cause of what are known as filth diseases, viz.: typhoid, yellow and scarlet fevers, diphtheria, cholera, dysentery, etc.

The soil being very porous, is constantly laden with large quantities of water and air, and when these bacteria are present in the soil, the water and air in the soil become likewise their carriers and direct communicators to the human body. Ground-water is constantly flowing through the soil under the same hydrostatic laws which govern the flow in streams, always seeking a lower level, and the streams and wells are thus supplied. But when the water has become charged with bacteria, they are not arrested by its flowing through the soil. The soil will arrest coarse material, such as grease and slime, but the bacteria diffuse with ease and follow the flow wholly unobstructed; and by their own development and multiplicity, and their accumulating numbers, they derive an accelerated vigor in their power to destroy human life.

Hence, a privy-vault or cess-pool, leeching into the soil and developing bacteria, charges the surrounding soil with multitudes of disease-producing micro-organisms, which, in turn, pollute the ground-water and air-cells, the ground-water flowing on to supply the neighboring stream or well; and from there these disease-germs are directly introduced into the system by an innocent-looking, sparkling beverage which nature intends should be healthful and life-sustaining. But by this contamination it is transformed into a rank poison, and when once introduced into the system, the disease-germ finding suitable conditions for development, intense suffering and premature death is the result.

Water being the principal agent for conveying nutrition to every part of the human system, deleterious matter, with which it may be charged, is passed very rapidly and completely to the whole system by the natural absorption of the blood.

Directly from polluted soil we likewise have polluted air. Decomposing matter is invariably exposed on the surface of polluted soil. The gases evolved from this, as well as directly from the polluted soil, are absorbed into the atmosphere. The gases from animal decomposition are, like those from the soil, charged with bacteria. By the process of transfusion of gases the air we breathe is then contaminated with these disease-germs. The air, when so polluted, makes an effort to oxidize and purify the deteriorating elements, with the result of lost vitality and unfitness to sustain animal life in health.

In the act of breathing, these noxious elements are introduced into the system, with the result of lowered natural vitality and great susceptibility of disease, and the blood becomes corrupted just as effectually as if it were inoculated by any known poison.

Pure air, pure water, and wholesome food are the three important agents for the healthful promotion of human life; they are likewise the weapons of defence against the ravishes of disease and premature death. These natural agents, provided in their normal purity, comfort, health, and longevity are the results; if, as is so sadly frequent, they are provided in an abnormal, polluted state, diseases, epidemics and premature deaths are the natural sequence. Popular sanitation, then, resolves itself into: 1st. The provision of wholesome food products, and the disuse of such food as has been rendered unwholesome by vicious adulterations, by improper cooking, by decomposition or decay; 2d. The provision for the constant exchange of breathed or vitiated air of the buildings in which we reside for a new supply from the atmosphere without; 3d. The maintenance of the purity of the soil in and about the habitations of mankind, and in the source of private and public water-supplies; and 4th. The prompt removal of the effete substances, which nature throws off from the human body, and all other filth common to a dwelling or community, to some point without where its contaminating influence cannot be exercised.

The sanitarian and scientist will continue to more clearly understand the specific nature of the propagating germs of different diseases, and, perhaps, discover the agent for their destruction. They will further teach many valuable lessons for the protection of man's natural heritage of health and longevity. But the four factors of sanitation given above compose a wide field of sanitation, and a thorough observance and practice of their teaching will lead to incalculable results for good. They are of such vital and imperative importance that they should constitute a popular study, and the knowledge of their effects and importance be not confined to but a few persons. All should study, understand and practice them. It is the latter two of these factors which leads directly to my subject. It is the necessity for the prompt removal of filth and the preservation of the purity of the soil, which makes a sanitary system of sewerage a positive necessity for towns and cities.

I have already shown that when the human excreta is permitted to accumulate upon the soil, or to leech through it, from privy-vaults or cess-pools, in any community, the result is, impure air, water, and soil. The same is true of bath-room slops, kitchen slops, waste water, cast promiscuously upon the surface of an undrained soil, to become a stagnant pool or hidden moat, and all the other various forms of filth common to the habitations of man in congregated communities. It seems, then, that there can be no further question as to the advisability and necessity of getting rid of these substances at all hazards. The question then arises: How can this best be accomplished?

Before proceeding to a discussion of the various expedients for the removal of filth, I desire to call further attention to the condition of things where no such provision is made, but where the deposition of excretal matters is made in cess-pools and midden pits. While such a practice was carried on by, and in harmony with, a primitive condition of society, it must be alluded to, as we need not go back to any remote period to find the people addicted to such a loathsome custom.

Repulsive as it is, we are forced to admit that it is a practice of our own time and of many of our own towns, and, in many cases, with little or no useful restrictions. It is not uncommon to find large sections of many of our towns, with the only place of easement a rough structure enclosing a heap upon the surface, or a shallow, open, unwalled cess-pool, within thirty or fifty feet of the kitchen-door or of the well which is supposed to furnish wholesome and pure water; that such a supply can be furnished is emphatically an anomaly. It seems, therefore, urgently proper that some evidence be given here of the dangerous condition engendered by such insanitary practices.

It has already been demonstrated that excrementitious matter leeching through the soil is fraught with great danger to life and health; that when it is accumulated upon, or within, the soil, it is thus conveyed to adjacent(?) wells is just as certain and just as plain as that the well renews its supply of water as fast as it is drawn out, the bacteria of putrefying human excrement passes, with water, through the soil with but little less retardation than the water itself. To give positive evidence of this, I will quote from reports and analyses given by Dr. W. H. Corfield, "Professor of Hygiene and Public Health at University College, London, ex-President of the Society of Medical Officers of Health," etc.:

"Thus, at Harpenden, Dr. Hunter reported, in 1864, that the wells were near to the cess-pools, and that the water was so execrable that it was actually abandoned by the people themselves. At Bridgport, where the cess-pools were often mere excavations in the soil, the well-water became turbid after rain, and it has been known to smell offensively, looking yellow, tasting strongly, with a pronounced drainy smell."

In the reports of the Medical Officer of the Privy Council (of England) are continually found such statements as that pumps and wells are "foul and unfit for use by infiltration from cess-pools; that the contents of wells are very foul, it being sometimes necessary to add chloride of lime to the water to destroy the offensive odor; the wells and cess-pools appeared to exchange with great facility."

At Rugby it has been physically demonstrated that the wells were fed by the cess-pools, and in many cases "the fluid thrown into the cess-pool in the morning is pumped from the well at night," and yet the taint was only apparent at intervals, or when the water had been kept. Thus a rank poison was—and is—not infrequently innocently self-administered. Such subtle enemies of life do not warn us of their approach with a blowing of trumpets or ostentatious appearance, but they make their deadly march upon us in an obscurity in which only the trained expert can detect them, rendering popular protection from them only in the practice of preventive methods.

The source of pollution of well-water was pointed out in 1844 by the Health of Towns Commission (England):

"As houses are built, and neighborhoods become more crowded, the pollution of springs (and wells should be added) by the permeation of matter from cess-pools becomes greater." And though the cess-pools may be deepened, and even cemented, this pollution of soil and water cannot be wholly overcome.

The first report of the Rivers Pollution Commission (English), 1868, contains some analyses of such well-water. In the case of a very deep well, known as Bevington Bush Well, at Liverpool, in "100,000 parts of water there were 86.7 parts of solid impurities, containing 12.61 parts of chlorine and 8.721 parts of combined nitrogen, of which 8.678 parts were in the form of nitrates and nitrites," which is strong evidence of "previous sewage contamination." The amount of the pollution of this water is clearly given in the following statement made in the report:

"Since its descent to the earth as rain, 100,000 pounds of the water had been contaminated with refuse animal matter equivalent to that contained in 86,510 pounds of average London sewage."

The above example shows that even the great depth of a well does not prevent its being contaminated in this way; though it does tend to show that there is a greater chance for the oxidation of the organic matters in percolating to a depth than to a shallow well. The report gives, as a general conclusion about deep well-water, that "when the well is at a distance from thickly-inhabited places, the quality of the water is generally excellent, but as the population around it increases, the water gradually becomes mixed with a larger and increasing proportion of excremental soakage."

Several interesting examples of the pollution of well-water by excrementitious matters are given in the third report of the same commission. Such water is there described as "the bright and sparkling, but often dangerous, beverage drawn from shallow wells, sunk into ground, reeking with filth and excrementitious matters." Thus the water from a well at the Blue House School in Frome, "contained unoxidized sewage matters, besides exhibiting a very large anterior pollution of the same kind."

Of the water from a well in Durham (England), described as one of the best, it is said that "this water, though clear and sparkling, is shown by our analysis to be little else but the percolations from sewers and cess-pits; 100,000 pounds of it contain the inorganic remains of as much excrementitious matter as is present in 62,360 pounds of London sewage, whilst the large proportion of chlorine, which it contains, shows that a good deal of urine mixes with it."

Of the water from the wells in Whitney, varying from a depth of six to fifteen feet, it is said that "the water from these wells is frightfully polluted and entirely unfit for human consumption; one of them which we have analytically examined, is supplied chiefly from percolations from sewers and cess-pools, and contains a large portion of unoxidized sewage matter, besides ammonia from urine." From these instances, it is very plain that well and spring water is dangerously polluted by storing excrementitious and other filth matters upon or in the adjacent soil. This could not be so unless the soil was first contaminated by these elements, since the water takes its foreign and impure substances from the soil as it percolates through it, having fallen to the earth in rain as a pure and wholesome beverage.

That impure soil makes impure air, there is no more question. We, therefore, have clear and positive proof that the deposition and accumulation of excremental and other domestic filth upon or within the soil about our dwellings, is fraught with great dangers, and it is a positive and infallible cause of diseases, epidemics and premature deaths, when produced in any congregation of dwellings, whether it be village, town or city. Such matters should be removed to points outside the community without any delay, regardless of cost. * * * *

The various methods by which excremental and other domestic filth is removed from within communities, has been classified under three (3) systems, viz.: 1st. Direct removal; 2d. Pneumatic; 3d. Water carriage. The first is generally applied to excremental matters only; the second to fæcal matters, and a minimum quantity of water; the third to excremental and all other liquid filth.

Under direct removal, are classed all the dry methods, such as the tub or pail systems—the "Eureka," "Goux," "Rochdale," "Manchester," etc. Dry closets—"Moule's," "Phillips'," "Taylor's," "Sanford's Carbon Closet," etc.

Of the pneumatic, the most important are the "Lieurnier," "Berlier," "LeMarquand," and the "Shone Pneumatic Ejector." The water carriage systems may be comprehensively classified as the combined and separate.

To effect a sanitary solution of the problem of filth removal, any system must comprehend a duty, which may be briefly stated, as follows: the immediate, rapid and complete removal of all domestic filth, such as waste water, water-closet, bath-room, bed-room, laundry and kitchen slops to some point or points without the town or city, where it cannot exercise a contaminating influence upon the health of the inhabitants.

In examining the various systems, I desire to determine to what extent they accomplish this object, and from which may be derived the greatest sanitary efficiency.

The Eureka tub plan was thoroughly experimented upon at Hyde, England. It consisted of the ordinary tub, containing a small quantity of disinfecting and deodorizing mixture, placed under the privy-seat for the reception of fæcal matters only, no slops being permitted to be added. The sizes of the tubs were adapted for several days' service; when becoming full, they were exchanged for a fresh tub. The full ones were covered by a tightly fitting lid and hauled in a close cart to a manure manufactory, where the contents were treated with more disinfectants, and ashes were added, making a manure of little value, containing only from one to two per cent. of ammonia.

The working of the plan was generally considered a very dangerous nuisance, and was soon abandoned. The plan did not embrace either of the three essentials of a sanitary plan, neither an immediate, rapid or complete removal of domestic filth.

The Goux system, otherwise known as the "Patent Absorbent Closet System," consisted of the ordinary tub or pail system, modified by lining the tubs with some sort of absorbent material.

The absorbent material was made from any sort of refuse animal or vegetable fibrous matters, mixed with a small percentage of sulphate of iron or lime sulphate. It is pressed closely to the bottom and sides of the tub by a suitable mould, leaving a cavity in the centre of the absorbent material. These tubs are designed as receptacles for excremental and bed-room slops only, and are to be removed weekly or twice a week. In practice, this plan has been found to be of but little use. The absorptive capacity is very soon exceeded, and the tub soon becomes the simple pail method, the only accomplishment being the *prevention* of soil pollution, with no regard for the purity of the air surrounding the tubs. The distinguishing feature of the Rochdale system is the provision of a receptacle for a disinfecting fluid, so that it can be applied to each deposition of fæces and urine. These tubs are to be emptied weekly or semi-weekly.

In the Manchester system, a receptacle for ashes is provided, so that the ashes can be immediately applied to the dejecta, acting as an absorbent and as an arrester of decomposition. The ashes must be applied by hand, after the style of the Hebrew children, with the paddle, under the Mosaic dispensation.

I have but simply described these modified pail systems, as I think a popular acquaintance with their details to be of little value. Wherever they are used, the natural tendency will be to harbor the filth in the community for a long time; at least, until the receptacles are full and running over, and as long as there is an absence of unpleasant odor. It is so well determined that any method of retaining filth within the neighborhood, that it would seem a dangerous practice to thus encourage this retention.

I am rather of the opinion that the common pail or tub closet for the deposition of excremental matters is even preferable, as their infallible effect upon the olfactory nerves serves as a constant reminder of their danger and of the necessity for frequent removal. It may be freely asserted that any pail system, without embracing daily removal and thorough cleansing and disinfecting of the receptacles, is an extremely dangerous and remitigated nuisance. "Moreover, this very frequent collection of filth by hand from houses, and its removal almost necessarily under the eye and nose of the household, is universally condemned by our domestic habits as nasty and offensive." The pail system can never become any success, either from an economic or sanitary standpoint. It fails to accomplish either of the three requisites of a sanitary solution of the filth-removal problem. It is neither immediate, rapid nor complete.

DRY-CLOSET SYSTEMS.

While the dry-closet systems likewise fail as a sanitary solution of filth-removal, they are entitled to somewhat more consideration, since they, in a great measure, overcome the dangers of the pail or tub systems, and may be said to have a conditional adaptability of some value. That they do, in fact, serve as a very valuable method for villages and very small towns, I shall attempt to demonstrate.

The principle upon which these systems are operated, is that ashes, charcoal, and some sorts of dry, pulverized earth, have extensive properties as deodorants, disinfectants, and absorbents of excremental matters. It proposes to directly apply one of these substances immediately upon the excremental matters. As stated above, however, it disregards any disposal of "slops" and other household wastes. The systematic application of these properties of dry earth has been effected by some mechanical applications, introduced by Mr. Moule, and designated as the Moule system. All other systems are but modifications of the essential features contained in the Moule system, hence a description of this will quite comprehensively embrace the whole dry-closet system. Quoting from the prospectus of the Moule's Patent Earth Closet Company, we have this description of the system: "It is founded on the fact of the deodorizing power of earth, a given quantity of dry earth destroying all smell, and entirely preventing noxious vapors and other discomforts. The practical application of this power consists in a reservoir for containing dry earth, and an apparatus for measuring and delivering the requisite quantity, so as to deal with every operation in detail." The essential features of this system, then, would seem to be, that the earth should be dry, and that each fæcal deposition should be at once covered with a sufficient quantity of dry earth. The application of the dry earth may be done mechanically or by the hand; the mechanical arrangements, however, seem never to have applied this to the dejecta in a completely satisfactory manner. It would seem likewise difficult to apply it by hand, so that the entire dejecta would be covered to the requisite depth, without a large quantity of soil is used, and as the supply of the soil, even in the necessary quantity, is the expensive part of the system, this becomes a formidable objection. The earth or ashes for this purpose is stored generally in a reservoir, built into the back part of the closet, and the requisite quantity is applied to each stool. By a chemical action of the dry earth, the complete disintegration of the fæcal matters takes place and no excremental matter can hardly be detected in the mixture, except by a slight odor that arises therefrom. An accumulation of several weeks is the general custom, and then the mixture is removed and dried and used again, and perhaps again as dry earth; while the substance still has great absorbent properties, it can hardly be considered a safe custom to repeat the use of the same soil without having first given it an opportunity of purifying itself by promoting vegetable growth.

The dry-earth system has been operated in many military camps, schools, colleges, hospitals and prisons with varied success. Wherever it has proved a failure, or caused any nuisance or disease, it may be safely asserted that it was due, not to the system, but to the improper workings of the system, such as a too limited supply of earth, or improper mechanical application. The great drawback to its use has been the enormous quantity of earth to be supplied, and the difficulty in obtaining earth suitable for this purpose. The most suitable soil is rich garden mold; following this in order of merit, is peaty soils, black cotton soils, clays, etc.; the poorest is sand.

The quantity of soil determined by practice to be sufficient to remove all smell from an average adult stool, varies from 1½ to 2½ pounds, according to the nature of the soil used, and 2¼ pounds of prepared proper soil is necessary for each use of the urinal. Provision should be made for three (3) uses of the urinal per twenty-four (24) hours, making a total per adult of 8¾ pounds daily. It would, therefore, require for a mixed population of adults and children, such as is found in a town or village, 6⅜ pounds per person per day, a total per 1,000 population of 6,375 pounds, or a total of 2,328,468 pounds, or 1,164 tons per year, and this, together with the ordure to be removed, would amount to 1,424 tons, making the total transportation per annum per 1,000 persons, 2,588 tons. The cost of this system may be estimated as follows: To dry, pulverize, haul, distribute, collect and haul away, could hardly cost less than $2.00 per ton, or $2,848; the resultant product, after being made into a poudrette, might be sold for 50 cents per ton, reducing the cost to

$2,136 per annum per 1,000 persons. Now, applying this to a town of 10,000 inhabitants, there would be required 11,640 tons of earth per annum, and a cost of $21,360, showing clearly the impracticability of operating the system in any but very small communities or detached public institutions.

In very small and sparsely populated communities, where each household could be induced to prepare its own dry earth, and utilize the resultant upon their garden, the cost would be reduced to a minimum, and give a service which would be a large improvement upon the cess-pool or pail methods.

Besides the impracticability of this system for larger towns, the service it gives is but trifling as compared with the water-carriage system. For every pound of human excreta treated by this dry-earth method, it is estimated that there is 190 pounds of other fluid refuse, of which it is likewise essential that it be removed, and which is removed by the water-carriage system. We have, then, when applied to large communities, a system at greatly increased cost, but giving only $\frac{1}{191}$ part of the service which is essential, and which is given by the water-carriage system; and yet, though this system lacks all the sanitary requirements of sewerage disposal, it is likely the best that can be adopted, when there cannot be obtained sufficient water for the water-carriage system.

To close the discussion of the conservancy systems, I will quote from an authority which must, indeed, carry conviction, it being probably the best authority that can be found—the Committee of the British Association on the Treatment and Utilization of Sewage: "All conservancy plans, including midden-heap and cess-pool systems, pail closets, dry-ash and dry-earth closets, etc., are quite incompetent, as the solution of the general questions of the removal of the refuse matters of a population. Such plans deal only with a small part of the liquid measure; towns which resort to one of them require, therefore, to be sewered. Such plans, moreover, all violate one of the most important of sanitary laws, which is, that all refuse matters which are liable to become injurious to health should be removed instantly and dealt with afterwards. With all these plans, it is an obvious advantage on the score of economy to keep the refuse about the premises as long as possible; and the use of deodorants of various sorts, or even of disinfectants, proves that this is the case, and that these systems all depend upon a fallacious principle. They should, therefore, be discouraged as much as possible, and only resorted to as temporary expedients, or with small populations, under exceptional circumstances."

PNEUMATIC SYSTEMS.

The Pneumatic systems which I have named above have been successfully operated in several cities abroad and have proved themselves to be of good sanitary service and especially applicable to low-lying districts, and such places where sufficient grade for the water-carriage system cannot readily be obtained, and at places where the sewage must be pumped to be conveyed to a proper outfall.

The distinguishing feature of these systems is, that the sewage is transported by air instead of by water. The pipes of this system are sealed, air-tight, and may be laid regardless of grade (except in the Shone system). By a central pumping station the air is exhausted from them, causing a rapid flowing in of external air through the filth receptacles to which they are attached. This sudden influx of air carries the sewage before it at a great velocity until it is all collected and disposed of. The objections that may validly be made to this system are the excessive cost and the improbability of thorough cleansing of the pipes by the passage of air through them. Inasmuch as we have not a city in our State which would probably have to resort to this method, I will forego a more detailed description of it and pass on to the

WATER-CARRIAGE SYSTEM.

Water, being itself the great scavenger of nature, cleansing our bodies, our clothes, our homes, our food and cooking utensils, it is, in fact, the natural agent of all cleanliness. When it has performed this service then it becomes itself foul and loaded with various impurities, and is no longer in a condition fit for the uses of our homes, and is a great source of danger to health if permitted to remain about our habitations. Consequently, it should be gotten rid of at once in the most expeditious manner. In getting rid of this waste water, it is made, by the aid of gravity, the carrier of excrementitious matter and all domestic filth. We have, then, a method effecting the immediate, rapid and complete removal of domestic filth by an agency which, being itself an oxidizer, checks the putrefaction until it is removed beyond a point of contaminating influence. This agent being water, this method is very properly known as the water-carriage system.

By the proper application of the laws governing the flow of water in pipes, and by the proper regard for known features concerning the flow of sewage through pipes, this system is made to solve, in the greatest sanitary degree, the problem of filth-removal. In proof of this statement, we have the many cases of death-rate reduction—some mentioned but many others omitted in this paper—due to sanitary measures, all have been effected where the water-carriage system has been operated. Indeed, it could not be otherwise, for the principle is oviously the correct one, causing, as it does, the *immediate, rapid* and *complete* removal of all deleterious substances. It does not permit filth to be harbored and experimented with upon the premises, nor to remain and pollute the air, water and soil immediately surrounding our dwellings. It emphatically should, and does, first remove the dangerous excretal and other effete substances, to a point beyond the power of exerting deleterious influences, and permit experimenting and utilization schemes to be practiced afterwards. I do not mean to say that the manurial properties of sewage should not be utilized and returned to the soil, but it is unquestionably the proper order that it should first be harmlessly removed and rendered itself harmless. The evil should certainly first be overcome, even should it cause the sacrifice of some good.

In the preceding pages I have shown that the tendency and the practice of all the conservancy or dry systems is to retain the filth about the premises for a long time after having simply deodorized it by dry earth or ashes; that it is thereby rendered harmless is only a presumption, and its correctness has not been borne out by any evidence whatever. Since we know so little of the effect of dry earth upon the disease-germs developed by putrefying excretal matters, but know so well the evil effect of these germs upon the health and life of man, it must be freely admitted that any system of conservancy is based upon an unsafe and wrong principle.

The only safety lies in getting rid of these obnoxious agencies in the most expeditious manner, and this is admirably done by the water-carriage system, in the cheapest manner possible, by the simple aid of gravity. It has been determined in practice that it costs but one-tenth to convey by water and gravity of the cost by cart removal.

It may be objected that a water-carriage system of sewerage, connecting as it does all parts of the town or city by a vast net-work of underground channels, has a tendency to freely circulate evil effects from accumulations in the sewer, and consequent generation of deleterious gases. But this is not a valid objection, as it can only occur from faulty construction, and is not a fault of the system itself. In constructing a system of sewers, it is not simply necessary to dig ditches and drop in the pipes, fit the joints with a little cement, and pass on. Such haphazard work in anything will surely prevent successful operation, and the evil results following such a course as this cannot justly be attributed to the fault of the principle. It is the abuse of the good principle that produces the evil.

In practice we have two water-carriage systems of sewage, the "Separate System," and the "Combined System." Under the "Separate System" the sewers are small and designed to carry only such substances as come properly under the head of sewage, which may be defined as the liquid and feculent refuse from dwellings and their appurtenances, leaving the storm-water and surface drainage to be treated separately.

Under the "Combined System," storm-water, surface and subsoil drainage is also included. Before discussing the relative merits of the two, I will briefly formulate the essential features for fulfilling the sanitary functions of a sewerage system. It should convey all sewage immediately and rapidly to the outfall, so that there can be no time for decomposition or generation of gases while passing through the sewer; to effect this, it should be of proper size and gradient, of smooth bore, and laid to true allignment and gradient. It should be so well ventilated that there would be a constant interchange of air from within and without the sewer, so that what gas, if any, might be generated, would be so diluted as to be practically harmless. It should be occasionally flushed, so that no accumulations which might adhere to the sewer from irregular flow would become sufficiently decomposed to generate sewer gas. It should be impervious to water and sewage throughout its length, to preserve the soil from sewage pollution. To recapitulate, the prime essentials of a sanitary sewerage are:

1st. *Immediate*, *rapid* and *complete* removal of sewage beyond the point of danger.

2d. It should prevent the accumulation of noxious gases by sufficient ventilation and proper construction.

3d. It should be susceptible to effectual flushing.

4th. It should be impervious. Any sewer deficient in either of these requisites is a foe to humanity, and should be at once either reconstructed or its use discontinued.

For the "Combined System" the sewers are necessarily made very large; they are usually constructed of brick and of various shapes. The preferable shape is ovoidal, with the smaller end down, as this form provides maximum velocity to the minimum flow. The brick is likely to be more or less rough and porous, causing retardation of flow, accumulations of shiny substances, and organic matters, and soil pollution. In time of severe rain, when the sewer is running full, or nearly full, the excretal matters being in suspension, are left adhering to the sides of the sewer and in the crevices at the joints, and this filth must remain there, decomposing and giving off noxious gases until an equally severe storm comes again to wash this down and deposit a fresh supply of this antidote of health, as the flow recedes.

With each heavy rainfall, there are various substances which pass the catch-basin and form deposits on the bottom of the sewer, causing accumulating obstacles to the flow. By these obstructions, the sewage forms itself into innumerable cess-pools, which, in the dry-weather flow, is unmolested in its natural development of sewer gas and bacteria, jeopardizing the health and life of every inmate in each house with which the sewer is connected. It should be borne in mind that the native heath of bacteria is in just such dark and damp places as this affords. It is the great amount of sewer gas that is thus generated, which makes it next to impossible to sufficiently ventilate such sewers. They can be ventilated, and much external air introduced into the sewer, but not in sufficient quantity to overcome or purify the great volume of gas that accumulates in such sewers. A very great and extremely popular objection to the combined system is, the great cost of providing such large sewers for carrying the storm-water to a distant point on account of its contamination when mixed with excrementitious matters, whereas, if it were not so polluted, it could, in most cases, at least, be readily turned into the natural channels and safely left to care for itself.

From what is above set forth, it may be reasonably claimed that neither of the essentials named above can be secured by the "Combined System."

On the other hand, each of these essential features can be secured and all these objections overcome by the "Separate System," when designed and constructed with proper engineering skill, under the guidance and direction of, and with due appreciation for, the sanitary requirements and the laws of sanitary science. There are many and divers objections to the "Combined System," both from an economic and a sanitary stand-point, which I might discuss, but I trust that enough is said to convince my readers that it is a radically wrong plan to turn excretal filth into the storm-water sewers. If storm sewers must be built, it will add but comparatively little to the expense to construct at the same time a system of impervious pipe sewers from the domestic filth only.

SEPARATE SYSTEM.

By a skillful application of the principles of the "Separate System," the solution of the filth-removal problem is greatly simplified. Instead of planning the sewers for the maximum of extremely variable flow, as in the "Combined System," with an enforced disregard for the dry-weather or sewage flow, we deal directly with this flow, with a comparative certainty as to its amount, which, as compared with the rain-water flow, is quite regular. It remains, then, but to determine the quantity of sewage which the system will be required to convey, and the proper adjustment of the size, form and kind of sewer proportionate to this service, to secure *immediate, rapid* and *complete* removal. Having secured this, each of the other sanitary requirements are but matters of proper design and construction. That the sanitary features and health-preserving efficiency of a system of sewers has been effected by the "Separate System" to a degree closely approximating perfection, has been in many cases demonstrated, both in this country and in Europe, where the system has been put into operation under a studied appreciation of the sanitary requirements and skilled direction.

The essential feature of this system is, that the sewers shall be small, or of a size just sufficient for the service which it is designed to perform. It has been determined that a small quantity of any fluid, when passing through a large channel or conduit, will have a sluggish flow and a total incapacity of removing obstacles in its path; but this same quantity, when contracted in a small or suitable conduit, flows with a rapid and accelerated velocity, with effectual scouring properties, removing any ordinary obstacles that may be in its path. Hence it is that the small sewers of the "Separate System" give a service vastly superior to those of the "Combined."

To illustrate this: It has been determined that a six (6) inch pipe running half full of sewage, with a grade of 1 in 40, will give a velocity of 3 feet per second, while the same quantity of sewage passes through a twelve (12) inch pipe with the same grade, will have a velocity of but 2 feet per second. Again, a 12-inch sewer, flowing half full, with a grade of 1 in 200, will give a velocity of 3¼ feet per second, a thoroughly self-cleansing velocity, while the same quantity of sewage, flowing through a 36-inch sewer, with the same grade, will give a velocity of 1¾ feet per second, which is not a self cleansing velocity.

The popular demand for large sewers is almost wholly founded upon fallacy. There has been, to some extent, a strong demand on the part of the laity and board of town commissioners that the sewers should be made "plenty big enough and some to spare," with the result that the sewer falls far short of fulfilling the sanitary demands, and the accumulations therein encouraged and effected make a serious item of expense in their removal. The popular demand regarding sewers should be that they be made *small enough* to perform the required service in an economic and sanitary manner. In a small sized, properly laid sewer, and properly adjusted to the required service, stoppages will rarely, if ever, occur, while, if it were replaced by a large sewer, stoppages will be constantly occurring, causing a large cost of maintenance and seriously interfering with the sanitary service which it is sought to obtain.

It has been so thoroughly demonstrated by actual experiment, that there can be no further question as to the efficiency of small-pipe sewers. A system of pipe sewers, properly adjusted and not too large for the work to perform, with proper grades and proper construction in all its parts, will *immediately*, *rapidly* and *completely* remove the domestic filth from without the town to a safe outfall, before any decomposition can take place, and while the sewage is comparatively innocuous and harmless. Not the least recommendation of the "Separate System" is the wide application to which it is adapted. Its cost being but one-fifth or one-sixth of the "Combined System," the smaller sized cities, such as we have in North Carolina, which would be debarred from the advantages of sewerage by the great cost of the "Combined System," can have all the benefits of the removal of domestic filth before the soil has become saturated and polluted by its habitual accumulation, by the application of the "Separate System," and at a comparatively small expenditure.

The scope of this paper will not permit going into the details of sewerage plans and construction. But I desire to briefly notice certain general principles, features and facts connected with sanitary design and construction of a sewerage system, which should be well known and practiced, especially by boards of city commissioners, when the subject of sewerage is brought up for discussion.

PLANS.

Whether it is intended to construct a system of sewerage for the entire town or city, or to construct sewers only for the most thickly populated districts or streets, the first thing to be done is to have a complete system designed, embracing the entire municipality and the natural drainage area contiguous thereto. Having the design for the system as a whole, such parts as are desired may be constructed at once without interfering with the future construction. This section, being a part of a final whole, is perfectly adjusted to the future demands upon, and the future extensions from it. It is a permanent fixture, and unlike sewers which are so frequently built by piecemeal, and without any order as to harmonious connections, it will not have to be torn up and reconstructed when it is desired to sewer the remaining portions of the town or city. But the system may be extended as required, and from the inception to the completion the system will be adapted to all its parts, and continually serve as a properly adjusted part of the development into an harmonious whole, each part being properly adapted to the service which it is intended to perform in securing the sanitary benefits of a properly constructed system of sewerage.

The importance of this point cannot be overestimated, for it must be clearly seen that in a comprehensive system, all the parts must be in intimate relation to each other, and in fact they will be largely interdependent for thorough and successful service of the system, and unless it is designed as a whole, this regulation of the parts cannot afterward be obtained.

MATERIAL AND FORM OF SEWERS.

The material to be used in the construction of sewers should be vitrified salt-glazed earthenware pipe, up to a size sufficient to discharge 5,000 gallons of sewage per minute, viz.: an egg-shaped sewer with diameters of 2 and 3 feet with a grade of 1 inch in 500.

This material being subjected to an intense heat to take the salt glaze, is very hard, durable, and impervious; the glazing protects the sewer from the disintegrating action of the acids common to sewage, and secures a smooth surface for the sewage flow, aiding the cleansing properties of the sewer. The form of these pipe sewers should be circular up to a diameter of eighteen (18) inches, and with some qualities of pipe to twenty-four (24) inches. Circular form is preferable, as it better resists the resultant of the external and internal forces acting upon it, and because, in the manufacture of sewer pipe, it is the most economic and the truest in form.

The elliptical or egg-shaped sewers have much in their favor in that they secure the greatest cross-section of flow for the wetted perimeter or frictional surface, and for their greater ability to resist the vertical pressure upon them which is the greatest of the external forces. So, that for sewers laid at a great depth, they are preferable to the circular form. In the larger sizes especially, where the volume of flow is likely to be subject to great fluctuations, they are likewise preferable. Their form should be made by compounding circular arcs of three different radii: the smallest radius for the bottom, a larger one for the top and a still larger radius for the two sides. The relative lengths of the vertical and horizontal diameters varies in the practice of different authorities, but a safe preference is the vertical equal to 1½ times the horizontal diameter.

SIZE OF SEWERS.

The size of the sewers in any system is dependent upon two factors, the volume of sewage and the grades obtainable. The chief objects to be obtained in regulating the size of sewers are, that they shall readily carry the maximum volume and secure a self-cleansing velocity. The velocity of flow is dependent upon the volume and rate of inclination. A small sized sewer must have a greater rate of inclination than a larger one to secure the same velocity, but the larger sewer must in turn have the same relative volume of sewage to its carrying capacity. Thus a ten (10) inch sewer flowing half full, to give a velocity of 4 feet per second must have a grade of 1 in 130, while a twelve (12) inch sewer will give the same velocity at a grade of 1 in 160, but it must be likewise flowing one-half full, *i. e.*, the volume of discharge must be 1410 gallons per minute, almost one and one-half (1½) times the volume necessary to secure the same velocity in the 10-inch sewer, which is 952 gallons per minute. Thus we see the need of the conscientious and painstaking performance of duty by the engineer in properly adjusting the size of the sewers of a system to the obtainable grades. The velocity necessary to secure self-cleansing properties has been determined by experiment and practice to be not less than 3 feet per second in sewer pipes of less than 12 inches diameter and not less than 2½ feet per second in pipes of 12 inches or greater diameter.

The minimum rates of inclination to secure this velocity is given by Latham as follows: a 4-inch house drain 1 in 90; a 6-inch sewer 1 in 140; a 10-inch sewer 1 in 230; a 12-inch sewer 1 in 450; a 15-inch sewer 1 in 550. But these figures presuppose the sewer to be flowing *one-half* (½) full, but it is so frequent that the flow will be somewhat less than this, that it is desirable when working to minimum grades to figure for a greater velocity when flowing one-half (½) full in order to secure a self-cleansing velocity for the minimum flow. This velocity is taken at 4 feet per second for sewers of less than 12 inches diameter and at 3½ feet for 12 inches and greater diameter in determining the following *desirable minimum gradients:*

Diameter 4 inches, gradient 1 in 53
" 6 " " 1 " 80
" 8 " " 1 " 105
" 10 " " 1 " 133
" 12 " " 1 " 238
" 15 " " 1 " 300
" 18 " " 1 " 350

I have already referred to the fallacious popular demand for large sewers, so I deem it proper to show the actual carrying capacity of various size pipe sewers, when properly constructed, believing that the municipal authorities who would intelligently act upon a sewerage project will find the information of great value and assistance. In preparing the following tabulated statements I will assume a quantity of 60 gallons of sewage per capita per diem, one-half to flow off in eight (8) hours, the sewers to flow one-half full, which is a liberal assumption. I will assume also the above minimum gradients and deduce the following data of the *actual carrying capacity of properly constructed pipe sewers:*

Diameter of Sewer.	Rate of Inclination.	Gallons discharged per hour.	Equivalent Population.
4 inches.	1 in 53	4,716	1,258
6 "	1 " 80	10,539	2,812
8 "	1 " 105	19,003	5,068
10 "	1 " 133	29,385	7,836
12 "	1 " 238	34,402	9,174
15 "	1 " 300	52,280	13,941
18 "	1 " 350	77,917	20,778

Thus we see that a four (4) inch drain is amply sufficient for dwellings and good sized hotels, boarding houses, schools, and public institutions, and an eight (8) inch pipe is proper for many street mains.

Sewers that are unnecessarily large are not only a useless expenditure of money, but they seriously deteriorate the sanitary service. Ill-planned sewers of excessive size frequently serve to *carry off* the sewage when the poor construction would cause stoppages in sewers of the proper size. But such *carry off* of the sewage is not the service that is contemplated in this paper; it is insanitary and extremely dangerous. It cannot be too often repeated that ill-planned and improperly constructed sewers are dangerous things to have about, and, in most cases, become worse than no sewers at all. "Eternal vigilance," both in design and construction, is the price of the full measure of sanitary service of a sewerage system.

FLUSHING AND VENTILATION.

These are classed together, as the object to be attained by each is the same, viz.: to prevent the generation and dangerous accumulation of sewer gas. There would be but little or no danger of this, in a well constructed system, removing the sewage rapidly to the outfall, if the sewers were always carrying the same volume. But as the flow is quite variable for different days and for different hours of the same day, there is a possibility of slight generation of sewer gas by the small particles and slimy matters adhering to the sides of the pipes, which would probably accumulate to dangerous proportions were no provision made to check this accumulation. This danger is, however, very effectually overcome by *flushing* and *ventilation.*

By flushing is obtained a periodic washing of the sewer of any particles that may be held in check from any cause. It is effected best by *flush tanks*, which discharge automatically at regular intervals with a great velocity and consequent cleansing power.

In a well designed and constructed system the periods of flushing may safely be from 24 to 36 hours apart, but in other cases it may become necessary to flush once or twice each day.

The quantity of the flush should be sufficient to secure a depth of flow slightly greater than that of the maximum volume of sewage.

A flushing apparatus should be placed at the head of each main and lateral sewer, and in some cases, at intervals along long lines of mains. Extensive systems of sewers should be divided into *flushing districts*, the districts to be flushed consecutively, beginning at the head of the system.

It will be evident that by such systematic and thorough cleansing the generation or accumulation of any great volume of sewer gas is prevented. The slight quantity which is in practice generally found to exist in sewers is innoccuously disposed of by proper provision for *ventilation.*

This consists of open shafts, connecting the sewer with the external air, causing a constant interchange and circulation between the atmospheric and sewer air. The sewer air is thereby diluted to a harmless degree and left free to maintain a uniform tension, whether the flow of sewage be warm or cold, great or small, thereby preventing its power to force the trap connections of houses with which the sewer may be connected.

It is desirable that means of access to and inspection of all the parts of a sewer be provided by the construction of *man-holes* and *lamp-holes* at short intervals along its course, and they may be constructed so as to serve in a dual capacity, and act as ventilating shafts, thereby greatly assisting to obtain the desired ventilation.

DEPTH TO WHICH SEWERS SHOULD BE LAID.

This is a local consideration, dependent upon the nature of the soil and other characteristics of the locality to be sewered. They should, in all cases, be at sufficient depth to secure the proper gradient of house drains to the rear of the dwellings along their course, so that for sites of great irregularity of contour they should be laid at a greater depth than for localities of a gently rolling or level surface.

Since no branch from a sewer should be made by a vertical connection, it will be seen that an unnecessary depth of the sewers is a useless additional cost, both to the main sewers and to the house connections, so that the minimum allowable depth of sewers should be carefully determined according to the surrounding conditions.

Upon this subject there is a paragraph contained in my report upon the sewerage of the city of Raleigh, which, I think, will bear repetition here, as follows:

"In determining the minimum depth to which the sewers shall be laid, I have departed from the general custom of laying the sewers to such depth as to drain cellars, and have no provision for cellar service. The advantages to be derived from cellar service in sewer pipes is the drainage of wet or flooded cellars in wet weather, and permitting the placing of hopper-closets in damp, dark, out-of-the-way places in cellars. While these may be advantages, the first, at least, they are attended by very great disadvantages and objections. The sewers, in many cases, must be laid to nearly twice the depth to provide cellar service—more than doubling the cost of construction. The limited extent to which cellars are liable to be flooded in this city, I do not think would justify such increased expenditure. The great objection, however, to such service—and I deem it a very serious one—is the provision and encouragement that it gives for placing hopper-closets in cellars. In such a climate as this, such a practice would be extremely dangerous. Closets, to be maintained healthfully, must have an abundance of the great purifying elements—sunlight and fresh air. In the dark corners of cellars they can have neither of these, and in the warm season (considering human carelessness) I see but little to prevent them from becoming very hot-beds of disease germs—a constant menace not only to those persons immediately around them, but to the entire city. I have, therefore, designed that the minimum depth of the sewers should be just sufficient to be below all water and gas pipes, beyond a possibility of contaminating the water service. Such depth I consider to be six (6) feet below the street surface.

We might permit of cellar service by the sewers in the strictly business portion of the city, where first floor and cellar space is very valuable, in such cases as the Sewerage Committee should deem urgently desirable, but with the greatest restrictions thrown around their use, and the care of and frequent inspection of closet connections."

In a city or town where cellars are liable to be frequently flooded, provision should be made for overcoming it, as it is very detrimental to the health of the community. Rather than place the sewers to a great depth for cellar connections, however, it will be found more economic and of much greater sanitary service to lay a pervious subsoil drain beneath the sewers at sufficient depth to lower the water level of the soil below the deepest cellars. In localities where the water level is high, the soil retentive and wet, and where phthisis is a prevalent disease, a system of subsoil drains should be constructed in conjunction with the sewerage system. The drains may be either beneath or beside the sewers in the same trench, thus drying the subsoil, which has been found in every case to greatly decrease the prevalence of this sickness.

In the foregoing pages I have consumed as much space as the occasion of this paper will permit, and perhaps more than my readers may enjoy, yet much that should be said is but only imperfectly and incompletely alluded to.

I have, however, endeavored to demonstrate the advantages of practicing sanitary measures and the dangers arising from their disregard. I have shown that the essentials are the provisions for the maintenance of "*pure air, pure water and pure soil*" in and about our homes. It has also been made evident that the first provisions looking to this end are a pure and wholesome supply of water and the construction of a *sanitary system of sewerage.* Having these as a foundation, a complete and perfect system of sanitation easily becomes a reality; without these prime essentials no amount of raking and scraping and garbage-collection can be developed into an effectual sanitary service. With these provisions, other sanitary measures may be carried out to perfection and preventable sickness and premature death may be wholly eliminated from the list of the results of moral criminality.

That what has been said in this paper may conduce, to some extent, to the consummation of this greatly-to-be-desired end, has been the earnest wish of the writer throughout its preparation.

WINSTON, N. C., January 10, 1889.

THE PUBLIC WATER SUPPLY OF TOWNS AND CITIES IN NORTH CAROLINA.

By H. T. Bahnson, M. D., Salem, N. C.

For much of the matter of the following pages the writer does not desire to claim originality. It is largely a collation of the most pertinent facts established by the researches of eminent sanitary scientists.

The necessity of a wholesome water-supply for our growing towns is rapidly increasing in importance, and this paper is written with a view to point out imperfections, if any exist, in such supplies as are already instituted, and to furnish data which may serve to prevent similar and perhaps graver errors in future undertakings of this kind.

If we study the history of modern towns we will be struck by the fact that a public water supply has generally followed a more or less destructive conflagration. The resulting loss of property has induced property-owners to take precautions against such calamities in the future. The average man will freely tax himself to insure the safety of his house and worldly goods, while he intrusts the lives and health of himself and family to the mercy of Providence. If Providence will preserve from disease and death, why will He not protect from fire? Which is the worse misfortune, to have a house burned down, or to see wife and children die of a preventable disease?

Probably these questions have not been asked; at all events, the prime object of a water supply seems to be the protection of property from fire. A town pays out of its revenues a rental upon the fire hydrants and the householder stints his family in the use of water, with an anxious eye to his water-tax.

The old heathen did better, as is shown by the remains of their magnificent acqueducts and public fountains and baths. Their water was used for cleanliness and the preservation of health—not to gorge the insatiable maw of that modern municipal toy, the steam fire-engine. Perhaps they lost more buildings, but they saved more lives.

Greek and Roman civilization looked to the health and bodily development of the citizen. Their religion consisted of the deification of heroes and the apotheosis of superior physical attributes. In this religion ablutions for the purification and invigoration of the body of the worshippers bore a prominent part. In the revolt against Pagan rites, which was brought about by Christianity, water was put under the ban because of the importance attaching to it in the heathen ceremonial. Self-abnegation and mortifying of the flesh took the place of personal cleanliness and attention to physical culture. Personal nastiness became the stepping-stone to canonization, and the odor of sanctity was no figure of speech. To the mind of such devotees, disease was of Divine origin, and plagues and pestilences were submitted to with resignation. An effort to prevent such visitations would have been regarded sacrilegious.

Out of this quagmire of superstition and fanatical perversion of Christian tenets the civilized world only gradually emerged after the lapse of centuries. Dogmatism and cant have been relegated to the limbo of the Dark Ages, where they originated, and "pure religion and undefiled" again demands a clean body as the abode of a pure heart. Science, the handmaid of religion, has displaced empiricism in medicine, and inaugurated the warfare upon filth as the cause of disease, which is the crowning glory of this age of progress and enlightenment. Most diseases can be prevented, some alleviated, and only a few cured. The prevention, therefore, rather than the cure of disease, is the goal of modern medical ambition.

The laws of life and health are daily becoming more clearly known and easier to comprehend, and it is the duty of the physician and sanitarian to bring them to the knowledge of the authorities and the public. But alas! the traditions and the prejudices of centuries are hard to eradicate, and although the ear of this generation can be reached by the propaganda of sanitation, the truths of its teaching usually require severe lessons to impress them upon the hearts and lives of a people. In spite of discouragements from wilful ignorance, or worse still, fatalistic indifference, modern sanitary science preaches and fights its crusade for the preservation of health and the prolonging of life, with confidence inspired by a righteous cause and the assurance of a final victory.

Water, from the earliest times, has been regarded as the symbol of purity. The sparkling dew drop, the refreshing rain, the bubbling spring, the dancing rivulet, the pellucid stream or lake, the deep, cold well, the crystal snow, the glass-like ice, to the natural eye present the embodiment of purity and healthfulness. It may be transparent and sparkling, grateful and refreshing, and yet, this apparently pure, health-giving water has carried in ages past, and is to-day carrying, disease and death to myriads of the human race. Modern science, with ruthless hands, tears away the veil which hides from our unaided eye the workings of nature's laboratory, and dispels our fondest illusions. It teaches us that "the moss-covered bucket" is a euphemism for malaria-breeding algæ, and "the life-giving element" we so eagerly quaff may be foul with pollution from stable and privy and swarming with death-dealing microbes.

Absolutely pure water does not exist in nature. Even the vapor in the atmosphere which surrounds our earth is laden with impurities and rich in minute organic life. The germs of the latter, owing to their great volatility, are carried by the wind to high altitudes and long distances; and, entangled in the crystals of snow, or gathered by the globules of rain, are precipitated upon the earth's surface. The red snow of Greenland, the wonder of our school days' geography, derives its color from microscopic vegetable spores, and the so-called "mountain fever" has been traced to a similar origin, viz.: vegetable spores from the melting snow, carried into the springs and other sources of water supply.

But it is upon the surface of the earth, and the few feet of loose soil which compose its crust, that we find the principal sources of water pollution. Dead and decaying animal and vegetable matter give life and sustenance to innumerable minute organisms, which we call microbes. Some of these are poisonous in their influence, while others serve as scavengers by promoting fermentation and putrefaction, resolving organic matter into its chemical constituents and fitting it to be absorbed by the radicles of growing vegetation. Saturated with decaying organic matter and the products of its decomposition, the water not needed for vegetable growth either evaporates from the earth's surface or passes into an adjoining stream, or percolates into the deeper recesses of the earth, until it is arrested by some impermeable stratum, from the edge of (or a seam in) which it bursts forth again in the shape of a spring. During its course through the deeper layers of the earth, it is constantly undergoing chemical and biological influences. The products of decomposition are thereby further resolved or eliminated by filtration, and the water appears again at the surface of the earth, nearly or altogether free from organic matter. Its purity in this particular depends, of course, upon the depth and character of the filtering material through which it has percolated. During its passage it dissolves and carries with it more or less, according to solubility, of the earthy and mineral matters which it encounters. Springs not being always accessible or of sufficient capacity, it becomes necessary to utilize the water from running streams and lakes or sink wells to the water-bearing stratum.

A spring or well deriving its water from a wooded or grass-covered area, protected from surface drainage and not holding in solution an excess of mineral or earthy salts, affords a healthful and perfectly satisfactory water-supply. Except in periods of great drought, the small amount of its organic and mineral ingredients would be no disadvantage, but only serve to make the water refreshing and palatable. But these desirable sources of water-supply can only exist in uninhabited, or at most, sparsely settled sections of country.

Surface drainage from uncultivated ground, especially if this be of a marshy character, contains a large amount of vegetable matter, from the decomposition of which, under certain conditions of soil and temperature, is developed the malarial poison. It is positively demonstrated that this poison is eliminated from water by filtration through the soil, and no malarial disease can be traced to a well or spring untainted by a direct inflow from the surface. Nature's process may be successfully imitated, and artificial filtration, properly conducted, affords protection against malarial poison in drinking water.

As a country is settled, however, we have other and more terrible foes to encounter, in the effort to maintain the wholesomeness of our water supply. The rotting garbage which litters our streets and yards, laundry and kitchen slops and waste, the pig-sty and barn-yard, and above all, the privy, furnish pabulum for the development of the germs of what are known as zomotic and filth diseases. Their germs once developed, permeate the soil. and it is only a question of time when, the earth's filtering power being incapable of arresting them, they invade our sources of water supply, and produce sickness and death. Amongst these diseases are the various forms of diarrhœa and dysentery.

Common diarrhœa, as distinguished from its specific forms, *e. g.*, cholera, occurs generally whenever drinking water is sufficiently laden with impurities to cause irritation of the alimentary mucous tract. In periods of drought and consequent supersaturation with impurities of the scanty water supply, diarrhœa and dysentery are especially prevalent and attended with great mortality amongst children and the aged and infirm. That in most cases, diarrhœas, sporadic and epidemic, are due to a specific poison, acting otherwise than as a simple irritant, is settled beyond a doubt; but this poisonous principle, almost certainly a germ, has not yet been definitely determined. In many cases of diarrhœa, occurring from the use of water, the pollution of the latter has been so great that its excess of organic matter could be determined by microscopical and chemical analysis, and quite frequently its odor and taste sufficed to condemn it as unfit for use.

Cholera is a specific diarrhœa. Originating along the water courses in India, where it is always endemic, its germs are carried by travel and commerce to all parts of the world. We know that it is especially transmissible by water, and the latter may be contaminated either directly by choleraic excreta, or by the absorption of the exceedingly volatile germs from the atmosphere. So rapid is their dissemination that neither natural nor artificial filtration can be depended upon during the prevalence of this virulent disease. In an epidemic of cholera, no water should be drunk which has not been thoroughly boiled, passed through a reliable filter, and kept in an air-tight vessel. Boiling destroys the germs of the cholera by coagulating the albuminoids. Filtration deprives it of these coagulated albuminoids, and restores its sapidity by replacing the air expelled in boiling. If it were possible to adopt generally the same precautions at all times, the cases of sickness and death caused by unwholesome water would be reduced to a minimum. Under the influence of a cholera scare, no expense, no sacrifice of comfort or convenience is thought too great to be rendered as a free-will offering at the shrine of this awe-inspiring Moloch. But cholera rarely visits our favored shores, and by a rigorous enforcement of quarantine regulations, we can entirely escape its ravages.

We read with horror of the desolation wrought by it a year ago in Italy and Spain; of cities decimated and abandoned by their terror-stricken inhabitants; of villages and whole districts depopulated, the living unable to care for the sick or bury the dead. We note with indignant amazement the squalor and filth, the unsanitary conditions which aided the dissemination and augmented the fatality of the pestilence, and, with Pharisaical complacency, we thank God that we are not as other men are.

We deliberately close our eyes to the fact that our country is constantly ravaged by diseases even more fatal, and quite as much due to filth as is cholera, for their origin and dissemination.

Foremost amongst these are diphtheria and typhoid fever. Both are produced by specific organic principles. Rotting garbage affords development to the germs of diphtheria, while the poison of typhoid fever has its origin in decomposing human excrement. The former is frequently, and the latter is almost invariably, conveyed into the system by drinking water. The deaths in this country every year from these two diseases outnumber by many times the severest epidemics of cholera or yellow fever. The latter, confined to a limited area, arrest the attention, while the former, on account of their widespread distribution, are regarded with equanimity, and submitted to as a matter of course. And yet, they are more easily prevented by us than either yellow fever or cholera. The latter diseases are of foreign importation, and a laxity of quarantine, for which we, as individuals or communities, are not responsible, may bring one or both of them upon us. Diphtheria and typhoid fever are home productions—the legitimate fruits of our own filth. The parent who throws his child into the fire, the husband who shoots his wife, the man who slays his neighbor, is justly condemned as a murderer. In what respect does he differ from him who breeds a pestilence that kills his wife, and child, and neighbor?

It is possible to evade or contravene human law, but the laws of nature are immutable and implacable; effect follows cause—crime brings punishment. The penalty may be delayed, but it is none the less certain. The foul drain, the reeking offal from kitchen and pig-sty, invite the waiting germ to breed the pestilence that throttles and suffocates our darling child, whose agonizing sufferings we are powerless to allay—whose piteous appeals for the help we cannot afford rend our bleeding hearts. The offending filth may be in our neighbor's premises, or on the public highway; this but shifts the responsibility, without mitigating the crime, or giving immunity from its penalty.

Diphtheria, as a distinct disease, was first described in 1835, as originating in the slums of Paris. Since that time, it has been recognized over the whole civilized world, and is justly regarded as the most fatal pestilence of modern times. In the city of Brooklyn, the mortality during the past twelve months was nearly one thousand, and in other parts of the country it claims its victims in like or even greater proportion.

Its transmission by water-pollution is abundantly attested. There is no necessity to go outside of the State for evidence. In Winston and Salem not less than thirty sporadic cases have occurred during the past two years. All of these were in families using well water. The surroundings were most favorable for its development—garbage plentiful, and pig-sties numerous. In the houses of neighbors using water from the public supply not one case occurred. It frequently happens that diphtheria is prevalent on one ridge or water shed. In one case, under my observation, the disease in the course of years traveled about twenty miles along one ridge, taking the lives of over one hundred children, and, except by contagion, not affecting a single person on parallel ridges. The dreadful epidemics, ten to fifteen years ago, in Company Shops, Charlotte, Newbern and other places in the State, can only be accounted for by the general pollution of the wells.

Sanitary science teaches us that the virulence of diphtheria can be mitigated, and its germs prevented from propagation, by cleanliness in our premises and surroundings. In the city of Pullman, where sanitation is enforced by law, the disease is unknown. We know further, that it is highly contagious, spreading rapidly from the person and surroundings of the sick, and particularly from the body of the dead. Yet the dead body of the little victim is often left exposed to be gazed at by friends and kissed by relatives, the bedding and furniture of the sick-room placed in the yard to poison the atmosphere, and the sputa and dejecta of the patient thrown upon the ground to pollute the surrouding wells. Isolation of the sick, thorough disinfection, and prompt sealing up of the dead body will limit the contagion, and yet there is not a law on our statute books to enforce these simple and necessary regulations. Probably more than one thousand children in North Carolina are yearly sacrificed to this preventable disease by our indifference and stupidity. Shall the blood of these slaughtered innocents cry out from the ground in vain?

Typhoid fever is not a contagious disease like diphtheria. Its poison does not spread from the person and surroundings of the sick, and if several members of a family or community are stricken down by this disease, they do not contract it directly from one another. The poisonous germs are found only in the evacuations from the bowels of the sick. These, thrown upon the ground, or cast into the privy, multiply with amazing rapidity; and, washed by the rain into a stream, or percolating through the soil into a well or other source of water supply, spread the disease amongst those using the water. Water so polluted gives no evidence of its fatal properties. Neither by chemical nor by biological analysis can the presence of typhoid fever germs be detected with certainty. Natural filtration does not exclude them from a well, and it is unreasonable to hope that artificial filtration can do more. They resist the chemical and biological influences to which they are subjected in passing through the soil, are unaffected by frost, and retain their virulence indefinitely. The dejecta of a single patient, during the winter of 1884-85, were thrown out upon the frozen ground, and by the thaw in April were carried into the reservoir which supplied water to the village of Plymouth, Pennsylvania. In less than one month over seven hundred, and in less than three months twelve hundred people using the water were stricken down with the disease.

Typhoid fever respects neither age nor sex, and regards previous condition only in so far that the negro race is perhaps less liable than the white to its ravages. It flourishes alike in country and town. From the mountain to the sea-shore, wherever human excrement, directly or indirectly, finds access to drinking water, typhoid fever prevails. Exemption can be secured only by having passed through the disease—a second attack is very rarely observed. A neighborhood or community may for a long time escape a visitation, but sooner or later its time will come, unless the proper precautions are taken. An absentee returning home, a transient guest, a child from school, may at any time bring the disease from an infected locality. In these days of rapid and easy travel, such contingencies are of every-day occurrence.

In the absence of a registration law, we can only estimate the mortality from typhoid fever in North Carolina by a comparison with other States which have such registration. Giving ourselves the benefit of every advantage, we are forced to conclude that not less than five hundred of our citizens annually die from this disease. In the United States typhoid fever kills more than thirty thousand every year, and we suffer our share of the mortality. For each death we may count at least eight sick on an average eight weeks. The great majority of victims to typhoid fever are in beginning maturity—the most valuable and productive period of human life. Such a life is certainly worth $1,000. Eight sick for each death means four thousand sick eight weeks each year, or an average of six hundred sick every day in the year. A low estimate of the loss of productiveness and the general and incidental expenses of sickness would be $1 per day for each patient.

Let us summarize:—

Five hundred deaths at $1,000	$500,000
Six hundred dollars per day for sickness, 365 days	219,000
And we have a total of	$719,000

—a sum equal to the entire revenues of the State, ruthlessly squandered and literally wiped out of existence—taken from the resources of our State and paid for the questionable privilege of mixing our own ordure with our drinking water.

These figures are appalling and may seem incredible, but let my reader examine his own family history and visit the neighboring grave-yards, and then make his own calculations. When he has accomplished this, I beg him to compute the anxiety, the sorrow and desolation—a task for which I confess myself entirely inadequate.

Other sources of water-pollution deserve more than the casual mention to which I limit myself. The blood and offal from slaughter-houses, the waste from manufacturing establishments, the refuse from saw and planing mills, should, for obvious reasons, not be allowed to rot upon the ground and be carried by storm-water into our streams. Sewage from paper-mills and tan-yards is especially objectionable, and the subsoil drainage from cemeteries is literally the draught of death.

Writers upon cholera in India ascribe its origin and virulence largely to the fact that the washing of clothes is carried on in the water which is used for drinking. How often do we see the washing of the family done at the well or on the bank of the spring? Need we wonder if such water is sometimes unwholesome?

The importance, nay, the vital necessity, for a pure water supply for our people, whether they are scattered over the country or aggregated in towns, must be conceded. As towns increase in population, the difficulty of procuring a wholesome water supply, and the dangers of its pollution, are correspondingly augmented.

It is asserted that a barrel of kerosene, poured into a hole ten feet in the ground, will contaminate all the wells in a radius of a quarter of a mile. Sooner or later, therefore, the poisonous products of decomposing filth must find their way into a well in proximity to a habitation and its out-houses. As population increases in a given area, so does the volume of garbage and filth and excrement. In addition to this, vegetation, which would otherwise assist in its disposal, decreases in inverse ratio to density of population. The bare ground of streets and yards becomes supersaturated with rotting refuse, which percolates through the subsoil into the wells. The germs of disease may not be in this pitcher full or that, but they will surely find us some day if we continue to use the water which contains them. A water-bed, or basin, cannot safely be used for concurrent purposes of water supply and the reception of offal. Sickness and death will follow as surely as the night succeeds the day. A new source of supply, therefore, must be sought, and this is the question that confronts every growing town.

It is fondly imagined by many that the purity of water can be determined by chemical or biological analysis. While water in which gross impurities are detected by either process is justly condemned as unfit for use, the reverse of this axiom by no means follows. There are many sources of error, and I will mention a few:

1st. Water analyzed to-day and found unobjectionable may easily become foul with pollution to-morrow. It is obviously impossible to analyze water every time we want a drink.

2d. Water purposely polluted with cholera and typhoid fever poison has been pronounced of good quality by chemical tests.

3d. Until we can recognize the germs of the various filth diseases, the biological analysis of water can give only negative results. There is every reason to hope that success will crown the painstaking efforts now being made to isolate and determine these poisonous germs: but even then their exclusion from our water supply must continue to be our only safeguard.

In the selection of a water supply, we should not be contented with an examination of the contour of the water-shed. It must be remembered that, in most sections of our State, the crust of the earth is of very recent formation—the result of denudation and atmospheric action upon the underlying rocks. These may, and, indeed, generally do, dip at a considerable angle to the surface. Surface drainage and subsoil drainage, therefore, are often in different or even opposite directions, and our calculations as to the area which supplies this or that water basin are frequently at fault. It must be evident, then, that we should have an accurate knowledge of the dip and strike of the water-bearing stratum. Nowhere could the services of a competent geologist or engineer be more profitably utilized than in the selection of a site for a water supply.

North Carolina is a well watered State, and our surface is not yet settled so thickly that a suitable area for a wholesome water supply cannot be found, in most cases, near a town. Such localities should be secured without delay, and zealously guarded against contamination. It needs no argument to convince a thinking man that this course is true economy. What ought to be done should, in all cases, be done at once. It is we who are interested in this matter, now in our own time and generation; for what does it avail us that our town is supplied with pure water ten years hence, if at that time it be remarked of us: "Ah, yes, I remember him well; he died of typhoid fever eight years ago." And it is an easy matter to so arrange the financial burden that part of it shall fall upon those who will hereafter participate in its benefits.

The purity of the water should be the first consideration. We must go to nature for this, and take advantage of her lavish generosity in this direction. In some cases springs may afford a sufficient supply, in others a large stream, in still others a neighboring lake. These failing, it may be there is an impervious stratum below our polluted water-shed, piercing which, we find an abundance of uncontaminated water. Such water is utilized in Brooklyn and Memphis, and is the hope of Newbern and Goldsboro in our own State.

Whatever the source, it cannot be too strongly emphasized, that it must be pure, and must be kept pure. The drainage area of the supply must be kept under the closest supervision, and the health authorities empowered to protect the many against the careless or wanton encroachments of the few.

Next in importance to purity is abundance of water supply. It has been well said that the true test of civilization is the consumption of water for domestic purposes. Although custom sanctions the practice, it is manifestly unwise, as well as unjust, to levy a tax on water for domestic use, and, without money and without price to the owner, pour a hundred or a thousand times as much into a burning building. Such a tax bears unequally upon the people, and is, in the case of the very poor, prohibitory. The latter, if possible, avoid using the taxed water, and resort to suspicious, if not certainly polluted, private sources of supply. A revolution of the present system can hardly be brought about immediately, but such a reduction of charges as will enable even the poorest to make ample use of pure, wholesome water is a sanitary necessity, and deserves the earnest consideration of town authorities everywhere. Sickness is impoverishment, health is wealth; and not only is the good name of a town injured, but the lives and health of the better classes are imperilled if filth diseases prevail among the poor.

The introduction of a wholesome and abundant water supply into a town is simply a question of money—not what it costs to obtain, but what it costs to do without. The inhabitants of a town must be short-sighted indeed, if they hesitate at any outlay which will prevent disease, increase their health and longevity, correspondingly augment their productive activity, and lessen their death-rate.

Vienna, in one year, decreased her mortality by typhoid fever from 341 to 11 per 100,000 by introducing spring-water in place of that drawn from the Danube river. Baltimore, Brooklyn, Memphis and other American cities have done equally well. How long would it take such a saving of life and health to balance the cost of the most expensive water-works?

Bad water affords a valid pretext for the use of alcoholic liquors to prevent its poisonous effects. If our prohibition friends deprive the poor man of his tipple, they should certainly aid in providing something more wholesome to supply its plaee. Apart from the encouragement and quasi-justification for the use of intoxicating beverages which unwholesome water furnishes, it is an established fact that polluted water causes more deaths, more sickness, more sorrow, misery and destitution than all the stills in the State.

Sanitation prescribes temperance in all things, and positive avoidance of morbific agencies. Compared to it, prohibition is a rush-light to the sun, an episode, a side-show to a great caravan. Sanitation once established as a governing principle in State and family, prohibition would naturally become a question of expediency to an elevated and enlightened public sentiment.

As has been mentioned above, the introduction of a public water supply has generally been with a view to protection from fire. Indeed, until within the past forty years, a connection between drinking-water and specific forms of disease was, at best, only suspected. Since sanitary science has positively demonstrated this causative relation, various expedients have been adopted in a futile effort to correct and remedy the impurities which are known to exist in established water supplies.

A brief mention of these expedients may prove interesting. The principal ones are sedimentation, æration, chemical precipitations, and various modifications and combinations of these processes. All of these are imitations of natural processes, and, of necessity, as imitations, fall short of the original.

Sedimentation takes place naturally in lakes and streams, and, on a smaller scale, in wells and springs. The particles of earthy matter, from their own weight, subside to the bottom, and along with them more or less of organic impurities. Storage reservoirs possess this advantage, and necessarily add much to the appearance and healthfulness of the water, their good effect being proportionate to their capacity and the length of time water is exposed to their influence. In seasons of unusual turbidity, no less than ten tons of earthy matter and one-half ton of decomposing organic substances are thus eliminated from the 20,000,000 gallons of lake-water which constitute the daily supply of Cleveland, Ohio. That the elimination of such a mass of putrescent filth is of the greatest advantage must be self-evident. Nevertheless, sedimentation is but a poor safeguard against disease. The infected water which prostrated twelve hundred of the eight thousand inhabitants of Plymouth, Pennsylvania, and killed one hundred and thirty, passed through three storage reservoirs to accomplish its deadly mission. Sedimentation is limited in its value and adaptability, and care must be taken to prevent stagnation in storage reservoirs.

Every one has noticed the greenish scum which generally covers a stagnant pond. If we follow the effluent of such a pond, we notice that very speedily the water becomes clear and sparkling, especially if there is enough descent to cause ripples or falls in the stream. This process has been successfully imitated by forced æration in some storage reservoirs, notably at Brooklyn, New York, where stagnation produced such a scum, and the filthy water was restored to a potable condition. The decomposition and destruction of the vegetable matter composing the scum, was effected by the oxygen in the air forced through it.

Chemical precipitation by means of alum, various salts of iron, lime, etc., etc., is a useful adjumant to sedimentation and filtration. It is not necessary to inquire whether the action of these agents is strictly chemical, or in part mechanical. They undoubtedly hasten the subsidence of the grosser organic and inorganic impurities suspended in water, but cannot be depended upon to eliminate the specific germs of disease. These are so tenacious of their vitality that their destruction could be accomplished only by an amount of purifying agents, which would be of itself dangerous to human life.

Artificial filtration consists of the passage of water through beds of gravel, charcoal, coke or other, porous substances. Theoretically, it is the most promising means for purifying water, and the result of the process, if properly conducted, is most gratifying to the eye and taste of the consumer; a perfectly limpid, appetizing water. The defect in artificial filtration is that it undertakes a thousand or even a million fold as much as nature. It has neither the time nor the surface to effect percolation after nature's method. More water passes through a filtering bed under strong pressure in an hour than nature purifies, on the same area, in one or more years. Some filters are arranged for a reversal of current and a scouring of the filtering material, and it is claimed that they are thus thoroughly cleansed. But who can confidently assert that such reversed current and even scouring will remove all the minute impurities which have been forced against the surface or entangled in the interstices of the filtering material? It is not denied that some organic matter remains after filtration, and it is only a natural inference, that owing to their minute size and great vitality, the germs of disease shall longest and most successfully resist elimination. The guarantee of a patent filtering company is worthless from a scientific, sanitary standpoint. A crucial test would be the prolonged use, by themselves and families, of water impregnated with typhoid and diphtheritic germs, and passed through their filter. They ought to have at least as much faith in their assertions as is shown by the veterinarian in England, who declares that hydrophobia exists only in the imagination of its victims, and, up to last accounts, had allowed himself to be bitten by 147 rabid dogs.

Filtration will probably remove malarial poison, and suffice to purify for drinking purposes the water from lakes and rivers. If these are of large size, we might reasonably hope, that if pollution existed it would be so diluted in a vast body of water as to be innocuous. And yet, Chicago, which derives it water supply from Lake Michigan, through a tunnel opening two miles from the shore, is about to extend the tunnel three miles further out to insure exemption from pollution.

The sum of our knowledge on the subject of artificial purification of water is thus tersely expressed by the English Commissioners: "Of all the processes which have been proposed for the purification of water polluted by excrementitious matters, there is not one which is sufficiently effective to warrant the use, for dietetic purposes, of water which has been so contaminated."

We may add: Water to which sewage has access, directly or indirectly, by surface or subsoil drainage, should, from that fact alone, be excluded from all consideration as a possible source of water supply for drinking purposes.

The sanitary requirements of a public water supply are only two in number, viz.:

First. *Purity—i. e.*, absolute freedom from apparent and possible, both present and future, contamination and pollution. This necessitates undisputed control and watchful supervision of the water-shed and the surface area supplying it.

Second. *Quantity—i. e.*, water in sufficient abundance and cheap enough to be used freely for domestic purposes by all classes. This requirement can only be met when the water works are owned by the town. Such ownership would result in the closing of private wells and springs, which are always liable to pollution.

Let us summarize the reports of the various public water supplies in the State, as furnished me by friendly correspondents, and see how these requirements are fulfilled.

Asheville.—Water taken from Swannanoa River, four miles above city. Stream is large, rising in the Black Mountains and flowing through a sparsely-settled and cultivated valley. Water occasionally turbid from rains. Filtered by Hyatt method, a combination of filtration with forced aeration and chemical sedimentation. Supply abundant. Works owned by the city. Meter rates, 25c. per 1,000 gallons. Average cost per year for a family of six persons, $10. Not yet in general use by poorer classes. Water introduced only a year ago, but since its introduction a marked decrease of typhoid fever and enteric diseases is noted.

Charlotte.—Water-works established 1881–'82. Owned by a company. Source of supply on outskirts of town, from several small streams and ponds; also surface water. Storage reservoirs of 16,000,000 gallons capacity. Water often muddy and liable to pollution, as company has control of only a small area of water-shed. Average consumption, 265,000 gallons per day—a little over one-fourth capacity. Water rates, 50c. per 1,000 gallons. Average cost per year for a family of six persons, $20. Not in general use by poorer classes, but increased healthfulness noticed among consumers.

Concord.—Supply taken from a remarkably pure spring near centre of town. No apparent connection with immediately surrounding area. Capacity, about thirty thousand gallons per day. Works owned by private individual. Water not in general use.

Durham.—Works owned by a company. Water introduced two years ago. Supply derived from several springs, six miles north of town, whose waters are impounded and collected into a reservoir. Surrounding country hilly and rocky, with sandy surface and clay subsoil. No habitations near. Reservoir closely fenced and whole works guarded. Water, after heavy rains, slightly turbid from clayey sediment. Capacity four times greater than is demanded by present size of town. Water is pretty generally used--at least, by better classes. Meter rates, 40c. per 1,000 gallons. Average cost per year for family of six persons, $16.

Fayetteville.—Present system of water-works introduced in 1824. Belongs to town. Supply is from springs just outside corporate limits. Water collected in a brick reservoir and conveyed through bored logs, connected by iron couplings. Capacity about eighty-five thousand gallons per day. In limited use. Rates, ...

Goldsboro.—No public water supply. Contract entered into by city with a Northern company to supply 2,000,000 gallons per day at a price for family consumption of $5.50 per faucet, making average cost per year for a family of six persons at least $15.00. Supply to be taken, if possible, from driven wells sunk below underlying marl stratum. This would probably be unobjectionable, but if water is taken from Little River its wholesomeness is questionable.

Greensboro.—Works established during the past year and belong to a company. Supply taken from springs ~~one~~ and ~~one-half~~ miles from centre of town, and beyond a creek, so as to be free from town drainage. Area supplying springs belongs to a private individual, with no dwellings, and mostly covered with forest. Supply limited and not yet much used. Water often muddy, ascribed to newness of storage reservoir, but as company proposes putting in a filter, there is probably surface drainage. Meter rates not to exceed 25 cents per 1,000 gallons. Average cost per year for a family of six persons $10.00.

Raleigh.—Works owned by company. Supply taken from Walnut Creek, above any possible inflow of city drainage. Area of water-shed extensive, embracing both cultivated and woodland, and including part of the village of Cary. Special legislation has been obtained for the protection of stream and water-shed, but its great extent renders proper supervision difficult, if not impossible. Capacity ample for present needs. Direct service from pumps, with stand-pipe pressure for fire protection. Water filtered by Hyatt method. Storage reservoir for filtered water. Meter rates, 40 cents per 1,000 gallons. Average cost per year for family of six persons $16.00.

Salem.—Water-works first established over one hundred years ago. Supply taken from springs of limited capacity and distributed in cisterns throughout the village. Superseded by present system in 1878. Works owned by a company. Supply derived from shallow wells, alongside the course of a stream which drains a section of Winston and Salem. Water always clear and tests have failed to detect connection with stream, or surface drainage. Storage reservoir for fire protection; direct service for ordinary consumption. Rates, 50 cents per 1,000 gallons. Average cost per year for family of six persons $20.00. Absence of zymotic diseases noted among consumers.

Salisbury.—Works owned by a company. Supply taken from Cane

Creek, two miles southeast of town, away from town drainage. Area supplying creek, largely cultivated ground. Water muddy and not used for drinking purposes.

Wilmington.—Works owned by a company. Water taken from Northeast River at its junction with the Cape Fear. River 450 feet wide at site of pumping-station. Subject to tidal influences. Located one mile or less above docks, shipping and sewers, and receives drainage from several cemeteries, slaughter-houses and a large part of the city, through a creek emptying into Northeast River one quarter of a mile above works. Rice fields on opposite side of river, and large guano works one mile above on Cape Fear river. Water discolored from swamps (cypress water), as is the case with nearly all river and pond water in Eastern Carolina. Supply unlimited. In only limited use for drinking purposes, though doubtless far more wholesome than the water in private wells. Meter rates, 20 cents per 1,000 gallons. Average cost per year for family of six persons, $10.00.

Winston—Works owned by a company. Supply derived from shallow wells alongside of a stream draining mostly cultivated lands and old fields, and receiving surface water from the suburbs of Winston. A dam across the stream and above the wells arrests its flow and serves for pumping purposes. Water never muddy, and tests have failed to show any connection with adjoining stream. Supply more than equal to demand. Water not in general use by poorer classes. Absence of zymotic diseases noted amongst consumers. Meter rates, 50 cents per 1,000 gallons. Average cost per year for family of six persons, $20.00.

As a model for comparison, I wish to describe the water supply of the Western North Carolina Insane Asylum. The water is taken from an impounded mountain stream, six miles from the asylum. The entire surface area of water-shed, which is covered with forest, is owned and guarded by the asylum authorities. Supply is ample for the present needs, and can be nearly doubled by erecting storage tanks in the upper part of the building. Service is direct, with a constant flow, and the water is free to the consumers.

Approaching nearest to the model set by the Western North Carolina Insane Asylum, we must place the Asheville water supply. Until the valley of the Swannanoa is well settled, the risk of pollution may be excluded, and the naturally pure water has the advantage of æration afforded by the swift mountain stream. Durham and Greensboro* are next in the list, their water-sheds only requiring watchful supervision to maintain their integrity. They are at present virtually under control of the water companies and need only to become actually their property to fulfill the first requirement demanded by sanitation. Raleigh's supply depends for its safety upon the permanency of the lively appreciation of danger at present evinced by its health authorities.

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*Since writing the above, I am informed that the impounding reservoir of the Greensboro water works is part of an old mill pond, from the main body of which, and the stream supplying it, it is separated only by a bank of muck and earth taken out for the purpose of deepening it. This reservoir is liable to overflow of back-water, and is partly supplied by seapage, from both pond and stream. Such being the case, Greensboro must be placed far down on the list of doubtful or dangerous water supplies.

Leaving Concord and Fayetteville out of consideration, because their supply is too limited to be generally utilized, we are compelled to place Winston, Salem, Salisbury, Charlotte and Wilmington in the doubtful list of water supplies, their risk from pollution, and their inability to avert the danger, increasing in the order in which they are mentioned. Without legislation they are all powerless to protect their water supply, while the last mentioned is besides at the mercy of influences beyond human control.

How well the second requirement is met I leave my readers to decide. How many poor families in our North Carolina towns can afford to pay a yearly water tax of $15 or $20, especially when it is considered that a plumber's bill of at least equal amount must precede the introduction of water to their premises?

I would not detract an iota from the praise justly merited by the public-spirited citizens who, realizing the necessity of their towns, and impatient with the apathy of municipal authorities and the general population, have invested their private means in the laudable undertaking to provide better protection from fire and superior water facilities. It is only just that these public benefactors should reap some reward besides the approval of a good conscience, and no man can grudge them the small dividends that are usually returned by such investments.

I can only repeat, that to enable all classes to make sanitary use of our public water supplies, the cost must be very much cheapened from the present figures, and the only way to accomplish this result, without injury and loss to individuals, is to vest the ownership of public waterworks in the town or city supplied by them.

If I have been followed, it must be evident that individual effort to preserve the purity of a water supply will not avail. Your well or spring may become polluted by your neighbor's privy or filthy premises, in spite of the strictest attention to cleanliness on your own domain. We have, to be sure, laws for the abatement of nuisances, and anything prejudicial to health may be complained of, and, if proved a nuisance, removed by process of law. The history of the expensive and prolonged litigations for the draining of mill-ponds in various localities in the State may be cited as instances of the cumbersome and inefficient action of the law. In practice, the law has become a prolific field for quarrels and feuds, and an effective means to exhibit spite and ill-will. It is often more honored in the breach than in the observance, and many a man risks the lives and health of himself and family rather than complain of the filthy habits and practices of his neighbors.

Whether sanitary laws are disobeyed through ignorance, carelessness or perversity, by yourself or your neighbor, punishment comes, and is as apt to strike the innocent as the guilty. Indeed, in many instances, it is the innocent especially who suffer, for it seems that there is to some extent an immunity from filth diseases in individuals and families who do not know what it is to be clean. They become, as it were, acclimated to their surroundings, and thrive in a filth which would sicken and kill more sensitive and highly organized natures. To these they become producers and purveyors of diseases from which they may be themselves exempt.

Communities demand protection from such influences, and appoint sanitary inspectors and boards of health, but by limiting their expenditures and crippling their executive powers by restrictive legislation, the object and aim of their existence is thwarted, if not entirely abrogated.

For the successful conduct of any business, a knowledge of his duty, executive ability and responsibility are required of an employee. How much more are these necessary in the maintenance of life and health—the business of mankind in this world, next in importance only to the salvation of the soul? Yet, how often do we see in a community a health officer appointed, not for his knowledge and fitness for the duty, but because his services, such as they are, can be obtained for the least money? Some communities, indeed, have no health officer, but entrust their sanitation to the mercy of a sanitary policeman, usually an ignorant hireling, whose principal recommendation is, perhaps, his known disregard for the nuisances he is expected to abate.

That we may know what we are about, we should first ascertain the facts as to the existence and prevalence of disease in our State. While it may prove difficult, perhaps impossible, to carry out in the rural districts, a system of death records and burial certificates should be enforced in every incorporated community, and the presence of contagious and infectious disease immediately reported to the constituted authorities. The physician who attends a case of such disease should be held responsible for its isolation and the disinfection of the excreta and surroundings of the patient. In this way only can our atmosphere and soil and water be kept free from the germs which cause and propagate disease. The health officer must prevent the accumulation and superintend the removal of garbage and filth, including the contents of closets and cesspools, in private as well as public premises. To accomplish this, he must be clothed with indisputable authority, and penalties should attach to those who obstruct him in his work, as well as to his failure to carry out these essential sanitary regulations. Returns at stated intervals should be made to the State Board of Health, one of whose functions it should be to direct and control the enforcement of the sanitary laws and hold to personal accountability its transgressors. As at present constituted, the State Board of Health is simply an advisory body, with no executive powers and only limited responsibility.

The public water supplies should be guarded with especial care by the local authorities, but in many instances these would be powerless without the co-operation of the authorities of the State. This is shown by the action of Raleigh in securing special legislation to prevent the pollution of its source of water supply. Without such legislation, every public water supply in the State, located outside the corporate limits of a town, is completely at the mercy of every ignorant or wanton trespasser. In Massachusetts, the law prohibits the drainage of any polluted substance into a stream within twenty miles above the place where it is used for a water supply, and gives the supervision of public water supplies to the State Board of Health. The approval of the board is a legal requirement for the introduction of every system of water supply or sewerage.

The report of the committee on the pollution of water supplies which was read at the annual meeting of the American Public Health Association at Milwaukee, Wisconsin, November 20th–23d, 1888, and from which I have made some extracts in this paper, concludes: "It is the well considered belief of this Association that it is an imperative necessity, that State Legislatures should give their boards of health that financial support which would enable them to act intelligently on all questions pertaining to the public water supply, investing them at the same time with the supervision of the said supplies, and with power to preserve these waters from contamination by sewage or other injurious matters."

It may be objected that a sanitary law, such as I have outlined, would be too costly. It may cost the one hundredth part of what is annually lost to the State by typhoid fever alone, and perhaps approximate or possibly slightly exceed the one four-hundredth part of the entire loss by preventable diseases. If it did not annually save one hundred times its cost, it would be a dismal failure.

If we look at what has been accomplished elsewhere, these statements will not seem unwarranted. In Michigan the saving of life from scarlet fever in the last eleven years amounted to 3,718; and in 1886 appropriate sanitary measures saved the lives of 298 persons, who, under the usual conditions, and according to former epidemics, would have died of diphtheria in a few localities. In Memphis, the death-rate has been reduced in six years from 35 per 1,000 to 23.8 per 1,000. In Chicago, the death-rate has been reduced in the last five years from 26 to 19.46 per 1,000, a saving of nearly 20,000 lives.

Let us take a lesson from Florida. Last winter a case ef yellow fever was smuggled into Key West. There was only a nominal board of health in the State, and the physician who attended the patient, just as is the case in our State, was under no responsibility to report the nature of the disease. Other cases appeared in various parts of the State, and the facts were suppressed. It was nobody's business to let the truth be known. Need I recall the terror and panic of the people of Florida, the horrified amazement of the rest of the country when it learned that nearly the whole State was infected by the dreaded pestilence? Leaving out the deaths and sickness, the mere money loss to the State from the suspension of business and the depreciation of the value of property, can only be reckoned by millions, while the confidence of the civilized world received a shock from which it will take years to recover. A properly constituted board of health would have had timely notice of the first case, and stamped out the disease before it became epidemic. It is needless to say that the first care of the Florida Legislature will be the establishment of a model State board of health.

Until the year 1885 the Legislature of the great State of Pennsylvania entertained the quite prevalent opinion that sanitation was a local affair, and restricted their sanitary legislation to the larger cities. Then came the Plymouth epidemic, and, as a result, a State board of health. Do we in this State need a similar lesson?

The North Carolina Board of Health need the moral and financial support of the people of the State to carry out their mission. If these are given grudgingly, only niggardly returns can be expected. Give them enough to prosecute their noble work, and if they fail to fulfill their promise and your expectations, they will deserve to be cast out as unprofitable servants.

The moral aspect of sanitation has been incidentally touched upon. If I point a loaded pistol at a fellow-man, and pull the trigger, I commit a murder. If I knowingly allow that man to be exposed to a disease which takes his life, am I innocent of his death? Human law may enonerate me, but how can I plead at the bar of God and my own conscience? The laws of life and health are plain and simple. They are the laws of God; we know them; happy are we if we do them. The time has come in modern civilization when ignorance and indifference cannot be pleaded in excuse for neglecting the enactment and enforcement of sanitary laws.

In ghastly mockery of the words of hope and resignation graven on the tombstones of our loved ones, who have succumbed to preventable diseases, we see standing out in letters of fire, which should scorch and sear our consciences: "Strangled by filth!" "Killed by wilful ignorance and neglect!"

The deaths from preventable diseases in this State are simply murders, and we are left to decide in how far each of us is answerable to the just Judge of all for the crime.

The ignorance and indifference, the fatal blunders of the past, cannot be remedied; we cannot recall the dead; but if to-day we mend our ways and heed the sanitary demands of the living, our loved and lost ones will not have suffered and died in vain.

THE DUTIES AND RESPONSIBILITIES OF COUNTY SUPERINTENDENTS OF HEALTH.

By J. L. TUCKER, M. D., Member of N. C. Board of Health.

Dr. Mapother, in his "Lectures on Public Health," defines "Hygiene or Sanitary Science" to be "an application of the laws of physiology and general pathology to the maintenance of the health and life of communities by means of those agencies which are in common and constant use." The law, recognizing the utility of a science thus defined, gives to the several counties in this State local boards of health, whose executive officers are to be chosen from the physicians legally qualified to practice, and are to be known as County Superintendents of Health. The "Duties and Responsibilities" appertaining to this office are subjects to which I would ask your brief attention.

The act regulating the duties of this important office may be briefly summarized:

It shall be his duty to collect vital statistics, to make medico-legal post-mortem examinations for coroners' inquests, to attend prisoners in jail, poor-house and house of correction, and to make examination of lunatics for commitment. He shall be the sanitary inspector of the jail and poor-house of his county, making monthly statements to the board of commissioners. The duties are further enlarged and the responsibilities increased so as to bring, with the advice of the local board of health, the important matter of inland quarantine under his control. Diseases dangerous to public health, viz.: Small-pox, scarlet fever, yellow fever, and cholera are to be quarantined and isolated at the expense of the county, town or city in which they occur. It shall be his duty to abate nuisances; and finally, the important matter of vaccination is committed to his care.

The field thus outlined is broad enough, and the soil sufficiently fertile to invite occupancy, with a promise of a rich harvest, not alone to the physician and sanitarian, but as well to the philanthropist and public-spirited citizen.

The system of medical and sanitary inspection, as applied to our jails, almshouses and houses of correction, has already yielded fruits of a most gratifying character, and the increased interest this matter is receiving at the hands of our Superintendents, in more detailed reports to the *Monthly Bulletin*, promises still greater results, which, from the very nature of the work, must commend it to the support of all good people throughout the State. But unfortunately, many of our counties are without health boards, and their public institutions are left without the care and superintendence of health officers.

It is almost incredible in this enlightened age, in which all the lines of art and science are advanced—an age so prolific of good works—that there should be a penal institution or a house of alms in the State in which the inmates are denied the blessings of sunlight, pure air and wholesome food; and yet, sickening and revolting as the recital is, such enormities are being constantly brought to the notice of the medical profession, some of whose members have been prompt in language, caustic and eloquent, to expose and denounce these cruelties. It has been but a short while since a distinguished* President of the North Carolina Medical Society, in his annual message to that body, directed public attention to this matter. Describing his visit to a North Carolina city, where he found a singular blending of "wealth and religion," piety and sin, in a city partly noted for the culture, elegance and refinement of her citizens, he thus describes his visit to the jail: "Inside an encircling brick wall, pierced by two small windows, was an iron cage, twelve feet square and twelve feet high; the cage was divided by one iron floor into two stories; each of these was subdivided into two cells and a passage way. After my eyes had become accustomed to the dim light, I counted twenty-four human beings huddled in these confined quarters. They were clothed in rags, and a few tattered pieces of blankets and sacks constituted their bedding. Many of these poor wretches had laid there for many months awaiting trial for petty offences; the place was reeking with filth, and the stench was beyond description. Every sanitary necessity was absent."

Other gentlemen, in language no less pungent, have directed attention to these foul blots upon our civilization, and to our county superintendents of health belongs the duty of redressing the wrongs. Let it not for a moment be supposed that our superintendents will fail in their duty. Frequent inspections, with detailed statements to the county commissioners, and given to the public through the *Monthly Bulletin*, setting forth the sanitary need of each and every public building, with suggestions as to the hygienic needs of the inmates, will arouse a sentiment in the counties which officials dare not oppose. Failing in this, let us take the matter to our grand juries, and in official capacity deliver them homilies on public hygiene, setting forth the dangers of overcrowding, foul air, impure water, and unwholesome food, and in the name of a common civilization, demand an abatement of these nuisances. The need of greater oversight upon the one thousand resident insane in the several counties cannot be too strongly emphasized. A register setting forth age, residence, cause and type of insanity, with frequent reports to the county commissioners as regards conditions, wants and needs of these people, will go far towards securing for them the care and treatment which an enlightened and civilized people are expected to bestow on the ignorant, helpless and unfortunate. These questions involve grave responsibilities, and are important enough to command the best executive ability and the profoundest medical and sanitary knowledge.

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*Dr. H. T. Bahnson, meeting of Medical Society at Charlotte, 1888.

Let it not be said, as has been said recently by a distinguished alienist, that "those* under county care are daily passing downward, by steady stages, to the level of hopeless alienation in such accumulating numbers that humanity sickens at the conception, both at what they endure now and what life has in store for them, and all who hold them dear." Let us urge upon our county commissioners the need of better facilities at our almshouses for the care and treatment of the insane, especially for those who are awaiting commitment into the asylums of the State, and as far as possible, let us use our efforts to ameliorate their conditions. Earnest, intelligent and brave endeavor on the part of our superintendents will remove present evils.

There are other fields to which the labors of our health officers can be profitably carried. The subject of public school education, to which the masses of our people are looking with so much interest, and the impetus which this important work will receive by the passage of the Blair bill, now pending before the National Congress, must render the matter of school inspection, by competent and trained sanitarians, of paramount importance. We are fast getting away from the traditional log school house, with its open crevices, its large chimney and its roaring fire, and in its place we are substituting frame buildings, tightly ceiled, with all possible defects of ventilation, and heated by that greatest curse of the age—the modern stove. To-day, in many of the rural districts, we have a number of school buildings, twenty feet square and ten feet pitch giving a total air space of about 4,000 cubic feet, in which forty pupils are being taught—just a little over 100 feet per capita of air space, and, with no other method of air displacement, except through a raised window or open door, the temperature at one moment sending the mercury to the roasting point and in the next lowering it to freezing. What an admirable opportunity is here offered to the medical expert in the study of the causative effect of foul air, cold draughts, and varying temperature in the production of winter catarrhs, to say nothing of the more serious lesions of pleurisy and pneumonia; and what a volume of interesting facts might be gathered in the study of the personal history of each individual pupil, as regards the development of pulmonary consumption, or the long list of nervous ailments, which neurologists trace directly to such influence. It can scarcely be expected that a costly and cumbrous system of inspection should be given in the present development of our school system. But as physicians and sanitarians, we can properly and profitably advise as to the location, size and arrangement of these buildings, grounds, drainage and water supply; methods of supplying sunlight, so as to minimize dangers to the eyes;

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*Eugene Grissom, M. D., LL. D., report Raleigh Insane Asylum.

furniture (seats and desks) adapted to all ages and sizes, and at the same time direct attention to the more salient points of danger to the health of the inmates.

In illustration of this point, I will mention that a few years ago, in the county of Vance, near the village of Townsville, an epidemic of typhoid fever occurred in the neighborhood school. There were more than ten cases (cannot be accurate as to numbers) in an enrolled school of about twenty-eight pupils. Dr. Wm. R. Wilson, a most competent and skillful physician and sanitarian, failing, after a most vigorous search, to find any possible cause for the epidemic, in the several homes of the pupils, carried his investigations to the school premises. Here he learned that many of the pupils had suffered during the year from diarrhœa, dysentery and other ailments, and that the session had been unprofitable to scholar and teacher alike. An examination of the surroundings disclosed a polluted spring as the source of contagion. The ground overlying the spring was covered with undergrowth, and had been used by the school for months as a "privy walk," and here we had soil saturation, or possibly excretal washings direct, water pollution, and as a necessary consequence, that disease of filth, typhoid fever. The nuisance was abated, a new supply of water secured, the epidemic stopped, and Dr. Wilson ever afterwards became a most active and zealous advocate of preventive medicine. It is a source of real regret that another State is to-day receiving the labor and teachings of this faithful and accomplished physician, whose first interest in public hygiene dates from this little incident. Doubtless, similar instances might be reported from other portions of the State, all calling more eloquently than words for medical and sanitary inspection.

Let us urge our superintendents to give to each and every school in their respective counties one careful and thorough inspection annually, and to file with the Superintendent of Instruction a report of the same, setting forth clearly whatever suggestions may appear necessary to promote the health and comfort of the school.

The subject of vaccination in our public schools should address itself more to our superintendents of health. I cannot, in the limits of this paper, recount the many arguments in favor of vaccination, and, indeed, to physicians such arguments are unnecessary, but as we are honored to-day by the presence of so many distinguished laymen, I hope I will be pardoned for recalling the well authenticated immunity enjoyed by the German army in the Franco-Prussian war.

The Germans never do things by halves. They believe in preventive medicine and practice it, in its highest and fullest sense, and in nothing is the strength of this proposition more beautifully exemplified than in the matter of vaccination. By statutory provision every infant is required to be vaccinated before it attains the age of one year; the child is revaccinated at twelve, and the subject who comes to discharge his military obligation to the sovereign is again revaccinated, the operation being repeated until the surgeon is satisfied that the person is insusceptible to vaccinia. The German army may, therefore, be regarded as a thoroughly vaccinated body of men. In France, on the other hand, vaccination and revaccination is not compulsory; perhaps it is done or not, as the danger of an epidemic may determine. During the war small-pox prevailed to an alarming extent, and both armies were equally exposed to the contagion, with the following results: The French army, scarcely more than one-half the strength of the German, suffered the frightful mortality of 23,468 from small-pox, while the German army suffered the insignificant loss of 263 men.

Another instance, quite as convincing, may be cited of Zurich, Switzerland. With a compulsory vaccination law in force, small-pox was entirely stamped out and for years was unknown, and yet, in three years after the repeal of the law, the death-rate shows 85 from small-pox in 1,000 deaths from all causes, or about one-twelfth of all deaths were from small-pox. Can any sane person require stronger proof of the prophylactic power of vaccination against small-pox?

The immunity enjoyed by our State for the past two decades from small-pox epidemics has lulled the people into a state of security utterly unwarranted by the history of the disease. Of the nineteen hundred and fifteen persons committed to the jails, as reported to the *Bulletin* for the past six months, only three hundred and seventy-three give evidence of successful vaccination—about one in five. A conservative estimate would place more than four hundred thousand of our people without this great prophylactic, and it is high time the importance of this matter was being pressed upon the attention of health officer, physician and the general public.

The advancement of public hygiene in this country for the past twenty years, has been due largely to the increased attention given by the State and county boards of health to the collection, preservation, classification and publication of vital statistics.

The chief statistics bearing on public health are of deaths, births and marriages. With these reports should be bulletins announcing all diseases dangerous to public health—especially those of an epidemic character. There are few persons who will question the value of such statistics, not alone to physicians and sanitarians, but as well to politicians, legislators, business men, and the citizens at large. Without a knowledge of the number of persons dying, the locality and cause of such deaths, it is impossible to know when sanitary remedies are needed, or, indeed, what remedies are to be applied. Without a comparison of the death and birth rate, it is impossible to form an idea of the "ebb or flow of the tide of human life," or as Dr. Billings so strongly expresses it: "Protection to public health cannot be given wisely without a knowledge of the persons and places who stand most in need of it, and this knowledge can only be obtained by a systematic, complete and continued registration of the births and deaths in every community of the State; such registration is, as it were, the eyes of the State Board of Health, and without it the board is like a blind man fighting a prairie fire." The statistics already collected in this State are suggestive, but are too meagre to admit of much valuable discussion. We are behind other States in this important matter, and few questions can engage your attention to-day more profitably.

Without suggesting a plan by which this important branch of the service can be perfected, I can express the belief "that where there is a will there is a way." Different States have different plans, some better than others, but none are perfect. No one at all acquainted with the workings of the North Carolina Health Board will, for a moment, doubt that the genius and wisdom of her executive officer will bring "order out of chaos," and in the near future unfold to us the details of a plan that will secure to us complete and accurate returns of births, deaths and marriages in every city, town and county in the State. With such statistics the board will demonstrate to you what sanitary science, practically applied, is capable of accomplishing, and that it is not, as has been said, "a mere jumble of unproved hypotheses."

The present law under which our statistics are collected displays its weakness in its great elasticity. An amendment here and there of a primitive character, to bear equally upon superintendents, county officials, doctors, midwives, undertakers, and the heads of families, will have a most salutary effect in removing existing evils. But the question may be pertinently asked: What are you going to give in return for such exactions from doctors, county officials, and the people at large? The answer is simple. If we were to apply the money test as to the value of the life of each citizen who dies from a preventable disease, as suggested by Dr. Farr, and corroborated by the veteran sanitarian, Edwin Shadwick, of England, it would make a sum so large that capitalists would be startled. It is enough for us to say that the amount saved to the State, as thus demonstrated, is so enormous that the most visionary dreams of speculation can offer nothing so alluring. But this is the weaker side of the question.

In return we promise diminished sickness, improved health, increased longevity, and the resultant blessings of happy and cheerful homes for every man, woman and child in North Carolina. "With decreasing mortality, there comes increasing longevity." Statisticians tell us that the duration of human life has been advanced from twenty-eight and below to forty-one years, under the ordinary workings of sanitary law, and that if mortality can be reduced to fifteen per thousand, and maintained at that figure, that the rate will be advanced to fifty-four years; and if we can reach eight per thousand, as suggested by the distinguished Dr. Richardson, in his beautiful picture of the ideal City of Hygeia, with her broad streets, lovely courts and faultless drains, her extended parks and silvery lakes and pure water, it will carry it up towards ninety.

The application of sound sanitary laws, as applied to the military forces in England, notably to the Royal Guards, shows a reduction of twenty per thousand to six and five-tenths, and under more rigid enforcement in the German army, the rate has been lowered to only five per thousand, with almost a total exemption from dysentery, diarrhœa, typhus and typhoid fever. And so in England and Wales, statistics, as applied to the people at large, show a reduction of the death-rate from forty per thousand to twenty, and in localities where sanitary details are practically and systematically administered, even as low as fifteen per thousand. Similar results can be obtained in this country, in our own State and for our own people; and as guardians of the public health, charged with the sacred trust of saving human life and lessening human suffering, we should press the importance of these matters upon the people, and arouse a sentiment commensurate with the great interests involved.

Lord Derby, years ago, felt the need of popular aid in solving the problem of public hygiene, when he declared that "no sanitary improvement worth the name will be effective, whatever acts you pass, or whatever powers you confer on public officers, unless you create an intelligent interest in the matter among the people at large."

Let our county superintendents of health take this great lesson to heart, and in all matters affecting public health, let them assume leadership and teach the people the great benefits and blessings that follow when sanitary laws are wisely administered.

SOME GAINS FROM SANITATION.

By J. W. Jones, M. D., President N. C. Board of Health.

Advance in civilization is founded on enlightened self-interest. The people have a right to protest against any demands on them unless there be promise of profitable returns, and to demand of the government the protection of their lives, their health, and their fortunes.

The real health of a people is not counted by its gold, silver and acres. These are sources of material and physical greatness; above these, as high as the heaven is above the earth, as a simpler question of value, is the health of the people. Here is the manhood, the real civilization, the source of its content, happiness, and its good will to men.

The best interest of the State is absolutely dependent on the family relation, and these on the Godliness, good order, and cleanliness of the individual. The greater part of the health of a nation is that income which is the outcome of national health. Public health, then, should be, as Lord Beaconsfield years ago expressed it, of the first consideration to the State, and should have the first care of the statesman. The prosperity of the State is the aggregate of the average prosperity of its citizens, and every increase of individual prosperity, every dollar earned by the citizen, is so much earned for the State; or, every detraction from the individual prosperity, of his time, or his money, or even his life, is so much taken from the States' social capital. And equally true is it, that all a man earns over enough for his living is so much added to the public capital; or that his living cost more from any cause than his earnings, that deficit is that much loss to the commonwealth; so, then, in the case of the premature death of a productive individual, his death is a withdrawal of so much productive industry from the State; or in case of his sickness, the suspension of such income as that would come from his labors if he were in good health. And so it follows, that as to man's ability to make available the forces of nature and the resources of the country, will be the value of the lands, and that any detraction from the citizen's ability is that detraction from the land's value.

Mr. Farr estimates the value of a Norfolk agricultural laborer at £246, and that of a professional man at £300. In that of a minor it is the deferred annuity, which represents the probable earnings of his manhood minus the amount spent in his maintenance during his unproductive childhood. Taking the relations of the different ages, their occupations and conditions, he has undertaken the laborious task of averaging these various factors to reach the mean value of the individual. From the statistics furnished him by the English Government, he makes the approximate minimum inherent money value in the united kingdom of every man, woman and child at £159, or $795 a head. In the United

States, under conditions of higher interest and wages, on Mr. Farr's estimates, his money value is put at $1,000, but more than this by some.

Vital statistics are made up from the reports of deaths, births, marriages, diseases and any other matter that pertains to the health of a people. *The present value* of a person is his future earnings, minus his necessary outgo in realizing these earnings.

From a study of carefully kept vital statistics, and tables of present values of annuities, the health and wealth of a country can be calculated with great accuracy.

If the present value of a person is $500 a year, and that person dies twenty years sooner than the natural termination of the life of a healthy working life-time, the loss to the community is the present value of the annuity of $500, with the interest for twenty years; or, if he should be sick, the cost of the lost time is a withdrawal of so much from the public capital, together with the cost of his living, nursing, medical attention, and medicine during his illness.

The advances made in the arts and sciences, the incidents of war, and the destruction of life by disease in the great armies of the world, and the great epidemics, first lead the way to the study of sanitation. The appalling disaster by disease in the past Crimean campaign has been turned into a victory to military sanitary science. The ravages of typhus fever in badly ventilated shipholds and prisons attracted the attention of the philanthropist, John Howard, and lead sanitary physicians to look to the construction of buildings in regard to disease. The pale faces and unsteady walk of the operatives, doomed to live in the badly ventilated and badly lighted houses and factories, was everywhere seen. So much had the public mind become impressed by these conditions, that in 1802 England manifested her recognition of the needed sanitary reform by the passage of a series of legislative acts for the whole kingdom. This was the beginning of our present system of State medicine.

In 1847 Mr. Chadwick made his great report to the Government "on the sanitary condition of the laboring classes," and so great was the impression made by this report that it resulted in the revising of the old poor law which had been in existence ever since the reign of Elizabeth, and had grown to be a burden instead of a relief to the poor. This revision has served as a foundation and a guide, not only for England, but for all other enlightened nations as well, and from its date preventive medicine became a distinct branch of learning. To day every enlightened government has its health department, nearly every State in our Union has its State and local boards of health, and in most of our schools and universities sanitary science is taught as a part of the course of instruction. Where sanitary science has been taught, and its regulations applied, there has been a corresponding lowering of the sick and death rate.

To the question, "*What are some of the gains by sanitation?*" we shall pass a reference to the sentiments of grief for the dead that should not have died, and for the sick that should not have been sick, and the joys for the saved from death and sickness, and reply only to that part of the question that can be answered in the language of figures.

Before the flood the average length of life was between 700 and 800 years. After the flood it gradually fell till it went down to 18 or 20 years; as learning revived, length of life increased. At the time of the beginning of the sanitary reform it was about 27 in England. At this time it is about 45 years.

The length of life in the reign of Victoria has increased 10 per 1,000, from 35 to 45. The government of this great and good Queen has ever been a friend to the reform; her Prince Consort Albert was ever pleased to promote it.

Dr. McVail, in his presidential address before the Sanitary Association of Scotland, last year, said in substance, that the death-rate in England and Wales in 1861 was 22.595 per 1,000, and in 1885 it was 19.310 per 1,000, and that the reduction between the years of 1861 and 1885 would make an annual saving in England and Wales, with a population of 30,000,000, of 100,000 lives. In American money, estimating each life at $1,000, and 20 cases of serious sickness to the death, at a cost in lost time, medicine, doctor's bill, nursing, food and rent of $100, the saving was annually $300,000,000; and that the children in one year have now divided among them nearly two millions of years of life more than would have been the case 35 years ago.

In London within the last century the death-rate has been reduced from 50 to 22 per 1,000, a gain of 28; in 1884, that of her contagious diseases from the average of 5.25 to 3.4.

In France, within this century, the average length of life has been increased 10 years, an aggregate of four hundred millions of years for the whole population.

Mr. Chadwick, in a paper on military sanitation, gives the following rates of deaths and gains in the great armies of Europe:

In the guards a quarter of a century ago the death-rate was 20 per 1,000, now it is 6½; while that of the home army was 17 per 1,000, reduced to 8. The rate of the whole English army, home and abroad, is 17. Germany has the lowest death-rate of any nation, namely, 5 or 6 per 1,000. In France, it is 10 per 1,000. In Austria, it is 11 per 1,000; for the whole nation 32. In Italy, 11 per 1,000. In Russia, 18 per 1,000, three times heavier than Germany. In these United States, 9 per 1,000; the nation 19. The men in the army are healthier than the class at home from which they were drawn, due to strictly applied sanitary regulations.

The actual mortality of both armies in the late civil war from all causes, from May, 1861, to June, 1866, was 304,369; killed in battle and died of wounds, 143,969; died from sickness, 360,400. in both armies.

At this the whole civilized world stands amazed and appalled, and justly so. It was the work of the demon of war, and yet our annual loss of life by preventable sickness, taking our population at this time to be 60,000,000, is 120,000, almost equal annually to what it was by diseases, killed in battle, and died from wounds in our late civil war in both armies, which was 126,000 annually.

There has been the most extraordinary gains by antisepticism since 1880, when Pasteur first saw the microbe of puerperal fever. It is seen in every department of medicine, but more especially in obstetrics and surgery. One case will serve our purpose to-day. In La Maternite, Paris, there is a line on the wall showing the total death-rate of women confined in that hospital from 1792 to 1886. The record is divided into three periods; the first that of inaction, in which the mortality was from 9.3 to 20 per cent.; the second, the battle of hygiene against infection and contagion, with a mortality of 2.3; and third, the victory of antisepticism, with a mortality of less than 1 per cent.

The gains from vaccination have been accumulating since the day of Jenner. In Paris, where the laws requiring vaccination are feebly enforced, the mortality from small-pox is from 10 to 136 to the 1,000; while in the German cities, where vaccination laws are enforced, the death-rate is but 1.44; in London, under compulsory laws, it is but 6 to the 1,000; while in parts of Switzerland, it runs up to 8 and 10 to the 1,000. The possibility of protective inocculation in other diseases is yet unknown. There are promises that in the near future its triumphs will be as great in some other diseases as it has been in small-pox.

Some years ago Messrs. Simons and Chadwick made the estimate that England and Wales lost annually 200,000 lives from preventable causes; France, 250,000; and Spain, 190,000. Mr. Billings estimates the loss of the United States at 100,000 on the census of 1850. These figures mean, that the United States loses annually of her citizens who should be saved, 100,000, at a money loss in deaths and sickness of $300,000,000 on the census of 1850, counting the cost of the dead at $1,000 and each case of sickness at $100.

North Carolina, with an estimated population of one and one-half millions, has annually, from preventable sickness, 3,000 deaths and 60,000 cases of serious sickness, at a money loss of $3,000,000 for deaths and $6,000,000 for sickness. Total loss from deaths and sickness, $9,000,000—a loss of $6 a head for every man, woman and child. The present death-rate of Raleigh is 38.4. Suppose we reduce this death-rate just one in the 1,000 this year, we save 15 lives and prevent 300 cases of sickness, and save $45,000. These figures show that one in every 500 of our population of 50,000,000, or one-fifth of one per cent., die that should not die; and that one in every 25 of our population are sick who should not be sick.

Sir James Paget thinks, from estimates made from reliable data, from reports of the benevolent and charitable institutions of England, that the annual loss of time in the United Kingdom is about one-fortieth of the working time, or nine days a year, for every man, woman and child between the ages of 16 and 65 years old.

We shall take it that two-fifths of the people of North Carolina are between the ages of 16 and 65 years old; then North Carolina, with a population of one and one-half millions, loses annually by sickness 9,000,000 days' work, and putting the cost of lost time, living and nursing during sickness, medicine and medical bills at $2 per day, $18,000,000. Raleigh, with an estimated population of 15,000, loses 9,000 days' work, in money value $18,000. The larger part of these losses could and should be prevented.